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TROPICAL DISEASES BULLETIN

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

Vol. 45] 1948 [No. 9

SUMMARY OF RECENT ABSTRACTS*

VII. HELMINTHIASIS

[*Continued from p.* 669]

Nematodes

General.—STOLL (p. 667) must be read in the original, he has written a valuable study, under the title of *This Wormy World*, of the probable incidence of human helminthiasis.

In his account of a helminthological survey of N. Rhodesia, BUCKLEY (p. 909) points out that as the Africans eat any part of the carcass of animals, the presence of eggs of certain worms in human stools does not prove true infection—the eggs themselves may have been ingested in the meat eaten. *Necator americanus* was the only hookworm found in this survey, and the incidence of infection was higher in cassava plantations (usually situated near villages) than in millet plantations (further away and probably with more scattered faecal deposits). *Strongyloides fülleborni* and *S. stercoralis* were also found, but *Ascaris lumbricoides* was not widespread. The last is usually associated with a congested population. *Acanthocheilonema perstans* was found in about 6 per cent. of blood specimens examined, but *Wuchereria bancrofti*, *Onchocerca volvulus* and *Loa loa* are not endemic.

EINHORN and MILLER (p. 215) have summed up their series of studies on intestinal helminthiasis in children of the Panama canal zones. They discuss age incidence, symptomatology and treatment.

LOUGHLIN and STOLL (p. 335) describe an acid-ether-xylol technique for examination of faeces for helminth eggs. Tests indicated that this gave better results than the Telemann and DCF techniques with *S. japonicum*, *Trichuris* and infertile *Ascaris* eggs. The test is described in detail.

OLIVER-GONZÁLEZ (p. 729) discusses the immunological relationships between polysaccharides derived from various infecting organisms, including several worms parasitic for man, and pneumococci. Cross-reactions, and the techniques used, are discussed in the original paper, which should be consulted.

Hookworm Infestation etc.—CANTACUZÈNE and LUPASCO (p. 529) have found hookworm infection in coal miners in Rumania where in some mines the rate of infection reaches 96 per cent. The sanitary conditions in the mines are bad, the atmosphere is warm and damp and the miners usually work barefoot.

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1947, v. 44. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

Clinical signs include digestive troubles, nausea, vomiting, epigastric pain and, occasionally, diarrhoea. KAMALOV *et al.* (p. 224) describe a focus of hookworm infection in Georgia, Russia.

STOLL *et al.* (p. 444) show that the incidence of hookworm infection is much higher in United States troops from the southern coastal States than from other parts, the majority of the worms being *Necator*. In troops exposed to infection in the Philippines most of the worms were *Ancylostoma*. There was no correlation between egg count and haemoglobin percentage, and very little between high egg count and high eosinophilia. There is good evidence that infection may be acquired by launderers who handle soiled garments which have been allowed to stand for several days in a damp condition. LOUGHLIN and STOLL (p. 735) take up this point. They have proved that active filariform hookworm larvae may be found in large numbers in blankets and nightclothes of patients with hookworm infection, if these are damped repeatedly and kept for several days. The larvae can migrate several inches. Launderers have been infected in this way in Guam and no doubt similar infection may be spread in hospital patients if the bed-clothes are dirty and damp.

KAMALOV (p. 668) has shown that infective hookworm larvae are capable of climbing vertically on blades of grass to a height of 22 cm., provided that there is a film of moisture on the grass. A person coming into contact with these larvae may be infected, even if wearing shoes and socks.

MOST *et al.* (p. 443) found hookworm infection in 6·2 per cent. of American soldiers who had not been outside the United States, and in 11·5 per cent. of soldiers who had served in the Pacific theatre. At an American Army General Hospital in the South Pacific, hookworm infection was found in 13·2 per cent. of those examined ; other nematodes were also found.

BLACK (p. 336) discusses the co-existence of tuberculosis and hookworm infection in Florida, where the latter is prevalent. The association of hookworm infection and sputum positive for tubercle bacilli, or of hookworm anaemia with tuberculosis, indicates a relatively unfavourable prognosis. PIERAERTS (p. 225) refers to the relationship between anaemia due to hookworm disease and lack of iron in the diet, and the disease known in West Africa as diboba, which in some respects resembles kwashiorkor.

CHAUDHURI and MUKERJI (p. 920) report a case in which tetrachlorethylene appeared to be the immediate cause of death, but the patient was very emaciated as a result of gross malnutrition. It is probably wise to withhold even such safe drugs as tetrachlorethylene from patients in this condition.

WRIGHT and GOLD (p. 224) have found 26 cases of the Loeffler syndrome in 76 patients with creeping eruption thought to be due to *Ancylostoma braziliense*. They think that the pulmonary infiltration is an allergic reaction to antigens from the larvae in the skin. The systemic treatment of creeping eruption due to *Ancylostoma braziliense* with drugs is disappointing ; HITCH (p. 921) found no definite evidence that certain antimonials and one arsenical had any lethal effect on the larvae, though they did relieve some of the symptoms, probably through a larvistatic action. ASTRUP (p. 836) has observed human infection with *Uncinaria stenocephala*, a hookworm of certain carnivores ; larvae were detected in the many small skin pustules. The mode of infection was not clear, though the author suspected a dog which commonly slept with the patient.

HARTZ (p. 101) has given a detailed description of the pathological changes found in the intestinal wall in a case of strongyloidiasis with internal auto-infection. The post mortem examination was made 40 minutes after death, and the findings cannot therefore be attributed to post mortem change. Details cannot well be abstracted further, and should be sought in the original.

GALLIARD (p. 1082) states that in Indo-China the type of *S. stercoralis* commonly found usually shows the indirect (sexual) cycle of development, but

that the direct (asexual) cycle also occurs. This is the reverse of the position in temperate climates, but the view (expressed by some workers) that the direct cycle does not occur in the tropics is wrong.

WATSON (p. 337) sums up the points of differentiation between hookworm, *Strongyloides* and *Trichostrongylus* infections.

DE OLIVEIRA (p. 96) prefers a preparation of carbon tetrachloride and oil of chenopodium for hookworm infection, and gentian violet for *Strongyloides*.

Ascariasis, etc.—*Ascaris* and *Trichuris* were found in almost all the inhabitants of a Portuguese village (DE MEIRA and COITO p. 1014). HSU (p. 1008) made a survey of intestinal parasites in school children and in university freshmen and servants, in Chengtu, where *A. lumbricoides* was common. Ascariasis is also common in New Orleans, and SWARTZWELDER (p. 225) shows that the chief symptom associated with it is abdominal discomfort; fever is quite often present. Intestinal obstruction occurred in 18 of 202 cases. BARBER (p. 736) refers to the surgical aspects of *Ascaris* infection, quoting several cases from Cyrenaica.

OLIVER-GONZÁLEZ (p. 226) has investigated the functions of the non-immunizing antigens present in *Ascaris lumbricoides*. The subject is complicated and is related to blood groups; the paper should be read in the original.

MUKERJI and BHADURI (p. 836) report quite favourably on certain indigenous drugs, derived from Indian plants, in the treatment of *Ascaris* infections.

Filariasis.—FLOCH (p. 103) shows that in a group of people in French Guiana the incidence of *W. bancrofti* was of the order of 12–18 per cent. of adults. *Culex fatigans* is apparently the sole vector. He discusses the relationship between elephantiasis and filariasis, concluding that elephantiasis may arise as a result of chronic streptococcal infection, and doubting its aetiological connexion with filariasis. FLOCH and DE LAJUDIE (p. 922) found *W. bancrofti* in 12–13 per cent. of Creoles in French Guiana.

HERNÁNDEZ MORALES and GONZÁLEZ BARRIENTOS (p. 228) found microfilariae of *W. bancrofti* in the night blood of 4·35 per cent. of 1,256 prisoners in Porto Rico, and BERCOVITZ and SHWACHMAN (p. 338) found them in the night blood of 3·42 per cent. of young Porto Ricans, very few of whom gave clinical histories consistent with filarial disease.

In part of Hyderabad the incidence of filarial disease was found by FAROOQ and QUTUBUDDIN (p. 669) to be 0·2 to 4·9 per cent. Microfilariae were found in only 1 of 138 persons with filarial disease, but in 15·5 per cent. of 584 apparently normal persons. Most of the microfilariae were *W. bancrofti* (92·4 per cent.); *W. malayi* was found in 7·6 per cent. *Culex fatigans* is the only proved vector, but species of *Mansonia* were present in the vicinity.

Examination of two American soldiers with filariasis contracted in the South Pacific showed that the microfilariae of *W. bancrofti* were present in the peripheral blood in greater numbers during the day than during the night, though they were never absent. EYLES *et al.* (p. 837) think that these microfilariae showed a degree of diurnal periodicity rather than, as is usually accepted, no periodicity. Microfilariae of *W. bancrofti* found in the Central Philippines show modified periodicity (AVERY, p. 445).

FOSHAY (p. 837) describes the cuticular morphology of certain microfilariae.

PRATT and NEWTON (p. 104) have studied in detail the progress of embryos of a periodic strain of *W. bancrofti* in *Culex fatigans*. In the conditions of these experiments the average numbers of larvae found per mosquito decreased from 48·7 at 16½ days after feeding, to 8·8 at 30½ days, the loss indicating the number that left the mosquitoes by the proboscis. At 16½ days there is considerable migration from the thorax to the abdomen, and 2 days later the larvae leave the abdomen for the head and proboscis. After 18½ days the larvae

begin to escape from the proboscis, but this escape may be independent of feeding, for instance where the proboscis contains 5 larvae or more.

HENRARD *et al.* (p. 103) show that *Anopheles funestus* and *A. gambiae* are easily infected with *W. bancrofti* in the Belgian Congo; *Aëdes aegypti* also supports its development, but *Culex fatigans* is a poor vector in this area. PERRY (p. 391) has found filarial infection in up to 52 per cent. of *Anopheles farauti* in the New Hebrides and Solomon Islands. HARPER *et al.* (p. 953) state that in the Polynesian islands the vector of *W. bancrofti* is *Aëdes pseudoscutellaris*, but that in the New Hebrides and Solomons *Anopheles farauti* and (probably) *A. koliensis* are chiefly responsible.

Studies on possible vectors of *W. bancrofti*, indigenous to the United States, are reported by NEWTON and PRATT (p. 337); three of the mosquitoes examined could be occasional vectors, and two others, *Culex pipiens* and *Psorophora discolor* are definitely capable of transmitting the infection under suitable conditions. Development of *W. bancrofti* from the S. Pacific, to advanced or infective stage, was found by EYLES and MOST (p. 838) in a number of mosquitoes indigenous to the United States, especially in *Culex pipiens* and *C. fatigans*, the latter being the commonest mosquito in the southern States.

GALLIARD (p. 1014) has succeeded for the first time in infecting both *Aëdes aegypti* and *Aëdes albopictus* with *W. malayi*. He discusses the apparent refractoriness of *Aëdes aegypti* to *W. bancrofti* in some places, and its susceptibility in others; there seem to be races of the parasites which vary in adaptability to the vectors.

FRANKS (p. 107) shows that the incidence of microfilariae in the blood is relatively high in persons (on the island of Okinawa) whose blood is of group A.

HIGHBY (p. 446) has shown that the number of microfilariae found per unit volume of blood in the stomachs of mosquitoes is greater (by 7 to 13 times) than the number found in the same volume of blood of the patient on whom the mosquitoes have fed. This is therefore a method of concentration which may be useful in diagnosis.

In the course of a paper on intradermal tests for filariasis in which an antigen prepared from *Dirofilaria immitis* was used, SAUNDERS *et al.* (p. 108) make the point that *W. bancrofti* is endemic in the southern United States. With this test they obtained a considerable number of immediate or delayed positive reactions in men from the S. Pacific, either with filariasis or who had been in the endemic areas, but also in few not so exposed. It appears that infection with any filaria will give a positive reaction, but probably not infection with other nematodes. The test is a useful diagnostic aid. WHARTON (p. 838) has used an antigen from *Dirofilaria immitis* in a skin test for filariasis in British Guiana, and finds it positive in almost all infected persons. He does not think that the presence of intestinal worms gave rise to false positive reactions, and he notes that patients with elephantiasis, and without microfilariae in the blood, gave strong reactions.

FRANKS (p. 446) has demonstrated two antibodies in persons infected with *W. bancrofti*, one directed against the microfilariae and one against the adult worms. He discusses the possible use of antigens from adults or microfilariae, for diagnostic tests.

WARREN (p. 923) has shown that the complement-fixing group-specific factor common to *D. immitis* and *W. bancrofti* is also present in *L. carinii* and *Trichinella spiralis*, though the last is not a filaria.

GELLHORN *et al.* (p. 602) have examined the plasma antimony concentration and urinary antimony excretion in man during treatment with organic antimonials. The high plasma level of Neostibosan suggests that this may be the drug of choice in treatment of blood parasites. The greater toxicity of trivalent than of pentavalent compounds was confirmed. CULBERTSON *et al.*

(p. 924) describe the tests which indicated that Neostibosan and Neostam gave distinct promise of usefulness in *W. bancrofti* infections. With Neostibosan, microfilariae disappeared completely from 23 of 35 patients, and did not return even after a long period of observation. Its effect is to kill the adult worms. BROWN and THETFORD (p. 338) report appreciable reduction in microfilariae of *W. bancrofti* in some patients as a result of daily injections of anthiomaline; there was no obvious difference in the rate of excretion of antimony between those who did and those who did not respond well to the treatment. CULBERTSON and PEARCE (p. 229) show that repeated administration of Stibanose (or Solustibosan) to cotton rats will eradicate infection with *Litomosoides carinii*, and they urge its trial in man.

WELCH *et al.* (p. 1015) report on certain members of the group of cyanine dyes which have shown considerable promise in the treatment of *L. carinii* infections of cotton rats.

OTTO and MAREN (p. 1083) have found that certain substituted phenyl arsenoxides are active against adult filariae of cotton rats and dogs; they are experimenting with these in man.

DUBOIS (p. 229) reports two cases in which prurigo was associated with infection with *Loa loa*. JOHNSTONE (p. 530) gives an account of his own infection with *Loa loa*, noting that the Calabar swellings were frequent in hot weather but rare in cold. Four adult worms were removed at different times from the eye, and after that the Calabar swellings have ceased to occur. No microfilariae were ever found in the blood.

GABATHULER and GABATHULER (p. 924) found onchocercal nodules in a considerable proportion of people in a village in eastern Tanganyika, but in comment GARNHAM points out that they did not use the skin-snipping technique. Immature stages of Simuliidae were present in all the streams. BOZICEVICH *et al.* (p. 669) have used antigens from *Onchocerca volvulus* and other filarial worms, in the diagnosis of onchocerciasis by intradermal and complement fixation tests. The *O. volvulus* antigen was more sensitive than any of the others and gave fewer false positive reactions in persons infected with other worms.

RUIZ REYES (p. 1015) gives Anthiomaline as an auxiliary to surgical measures in the treatment of onchocerciasis.

In one of the three onchocerciasis areas of Kenya, where *Simulium neavei*, the vector, breeds in limited stretches of two rivers, GARNHAM and MCMAHON (p. 1084) have succeeded in eradicating the flies, probably permanently, by applying to the rivers emulsions of DDT in oil and water, to produce a DDT concentration of 2 p.p.m. for 30 minutes at intervals of 10–14 days for 6–7 months. This was enough to kill the developing forms of the flies in successive batches, and at length no living flies could be found. Re-establishment of the flies is unlikely. No serious harm was done to other forms of life. The technique adopted is described.

PEEL and CHARDOME (p. 339) have found *Microfilaria streptocerca* in chimpanzees in the Belgian Congo, and after having examined the adult worms, have assigned them to the genus *Dipetalonema*.

In an enquiry into *Dracunculus medinensis* infection in a village in the Deccan, India, LINDBERG (p. 925) shows that step wells are apparently more dangerous than curb wells, though the latter are also associated with many infections. Infection was rare under the age of 4, but rose to 85 per cent. at age 30–35, after which it fell. Most infected persons had only one or two worms, but one had 50. In most cases the head of the worm appeared below the knee. The chief intermediate host was *Thermocyclops vermifer*. The same author (p. 925) shows that incidence is high in Jodhpur where the inhabitants depend on rain water collecting in shallow depressions. The period of onset

is highest between May and September; high temperature is an important factor for the development of larvae in the intermediate host.

SHARMA and HUSSAIN (p. 737) report on infection of dogs, in India, with *Dracunculus medinensis*.

WHARTON (p. 106) has successfully transplanted adult *Litomosoides carinii* from infected to uninfected cotton rats. SCOTT (p. 447) describes the infection of cotton rats with the filaria *Litomosoides carinii* by the bite of *Liponyssus bacoti*. He (p. 839) describes a technique for quantitative infection of the cotton rats with larvae removed from the mites by teasing, and injected into the cotton rats by syringe. With his colleagues (p. 840) he describes the technique of rearing the mites.

Enterobius infection.—SWELLENGREBEL and SCHÜFFNER (p. 448) have proved that eggs of *Enterobius vermicularis*, at least 3 days old, can infect, and that if in any patient further infection can be prevented, the worms cease to be passed out after a relatively short time, and the infection dies out. The difficulty in practice is that infection from fingers and from materials is so difficult to prevent. The authors discuss treatment.

BIJLMER (p. 111) reports a case in which very large numbers of immature *E. vermicularis* were found in the tissues of the rectal wall of a man who died from gangrenous ulceration of the small and large intestine. The worm invasion was probably a secondary phenomenon.

GELLER (p. 927) has examined *E. vermicularis* (and the comparable *Passalurus ambiguus* of the rabbit) obtained from various parts of the large intestine, in relation to the stage of development of the eggs they contain. He concludes that these worms cannot multiply in the intestine, without being discharged. MADSEN (p. 110, 840) thinks that the migration of female *Enterobius vermicularis* out of the anus is determined by the maturation of the eggs in the uterus, and that the worms wander out to lay eggs in batches, periodically at intervals of about one month.

Trichuris and Trichinella infections.—Experiments in a mental hospital indicated that the treatment of choice for *Trichuris* infections was administration of emetine in "enteric-sealed" tablets by the mouth. BURROWS *et al.* (p. 926) obtained the best results with 2 grains for 6 days.

WIRD (p. 111) describes an outbreak of trichiniasis in Sweden, in which 35 of the 37 infected persons were positive to a precipitin test. The incubation period was 14–24 days, shorter in severe cases. The onset was often vague, with oedema of the eyelids, nausea, vomiting, diarrhoea, fever, headache and eosinophilia. Skin tests with *Trichinella* antigen were not reliable. ROTH (p. 112) describes 5 immunological tests used in this outbreak, of which the most sensitive is the microscopic precipitin test, in which living larvae are placed in suspected serum, forming a precipitate if the serum has immune bodies. OPPENHEIM *et al.* (p. 449) describe an outbreak of trichiniasis in prisoners of war, acquired from uncooked pork; the chief symptoms were weakness, fever, headache, muscle pains, swelling of the eyelids, sweating, nuchal tenderness and anorexia. Treatment was symptomatic, since the authors do not believe that any anthelmintic will affect adult worms. *Trichinella* could not be found in faeces, gastric contents, spinal fluid or blood. An outbreak of trichiniasis in New York City is described by SHOOKHOFF *et al.* (p. 603); this was due to uncooked pork sausages. The incubation period was from 2 to 35 days. There were no deaths, and the authors comment on the relatively low fatality rates in recent years compared with those which occurred in the 19th century. The explanation probably lies in the fact that as a result of improved control measures, the infections have recently been much lighter than before. Symptoms are described, and the point is made that almost all patients had eosinophilia of over 10 per cent. The eosinophil count is the most useful single laboratory test

for trichiniasis—better than precipitin and intradermal tests (which are discussed), and considerably better than biopsy.

LEHMENSICK (p. 230) has found *Trichinella* in foxes in Germany and suggests that one cycle of human infection may be fox–wild-rat–house-rat–pig–man.

PORTWOOD and SANDERS (p. 448) have studied the electrophoretic and allergenic properties of fractions of larvae of *Trichinella spiralis*, but the details of this work should be sought in the original. *Charles Wilcocks*

RABIES

SORIANO LLERAS, A. Nota sobre la rabia en Colombia. [**Note on Rabies in Colombia.**] *Repertorio Med. y Cirugia.* Bogota. 1948, Mar., v. 3, No. 9, 677–8.

In the present article—the continuation of a previous paper on the same subject [this *Bulletin*, 1947, v. 44, 1029]—the author deals with the occurrence of human rabies in Colombia and with the effect of specific treatment thereon.

Unfortunately certain of the statistics are inaccurately presented and greatly lessen the value of an otherwise informative contribution. The following, for example, are difficult of reconciliation :

(*a*) of the 125 deaths from human rabies during the six years 1940–45, there were 54 (43·2 per cent.) among bitten persons, who had received complete courses of treatment with SEMPLE's carbolized fixed virus vaccine and 71 (56·8 per cent.) among those who had had no treatment or but few injections ;

(*b*) the numbers of deaths from human rabies in the period 1940–45 were, beginning with 1940 : 25, 26, 29, 17, 20 and 12 ; *i.e.* a total of 129 ;

(*c*) of the 38,625 bitten persons treated between 1940 and 1945 there succumbed to rabies 129 or 0·34 per cent.

On the other hand it seems clear that of 3,023 bitten persons, who during the four years period 1942–45 had received full treatment, only 38 or 1·26 per cent. developed rabies. This result is held to establish the protective value of the vaccine in use, on the ground that according to the estimate of the Pasteur Institute, Paris, 16 per cent. of persons bitten by rabid animals and remaining without vaccine treatment fall victim to rabies.

It is noteworthy that in Colombia the shortest incubation period of rabies observed in man was 6 days, the longest 5 months. [In nature it is seldom under 10 days.]

The annual number of cases of human rabies in Colombia shows that the problem is much more serious there than in many other American countries ; in the neighbouring countries of Ecuador and Venezuela, for instance, human cases are rare. [In the United States cases of human rabies totalled 143 in 1890, averaged 63 annually between 1910 and 1920, numbered 105 in 1928 and thereafter declined. In Canada human cases are rare.] *G. Stuart*

LIEOU, Y. C. & KOUO, C. C. Premier cas chinois de maladie d'Aujeszky. [**First Case of Aujeszky's Disease in China.**] *Ann. Inst. Pasteur.* 1948, Feb., v. 74, No. 2, 130–33.

In this paper the authors describe the first occurrence in China of the condition known as Aujeszky's disease (pseudo-rabies, " mad itch ").

The following paragraphs summarize the clinical manifestations in the affected animal—a cat belonging to a Shanghai family—and the laboratory findings on which diagnosis was finally based.

Clinical history.—The disease commenced suddenly and ran its fatal course in early January 1947. Between the 5th and 7th the cat had recurrent attacks of vomiting and diarrhoea; on the 7th, profuse salivation and anxious expression were noted; on the 8th, there was paresis of the hind legs; on the night of the 8th–9th, the cat died. The clinical diagnosis made by an experienced veterinarian was rabies: on this diagnosis two persons, bitten while handling the animal, sought anti-rabies treatment.

Laboratory Investigations.—(*a*) Histopathological examination.—On section, Ammon's horn showed: neuronophagy, perivascular infiltration with leucocytes; eosinophilic cell inclusions resembling Negri bodies in size and shape; smaller red-staining bodies situated extracellularly and within capillaries.

(*b*) Inoculation experiments.—Material from the medulla introduced into rabbits produced intense itching as principal symptom and death in short space of time; after the intracerebral inoculation death occurred in from 22 to 60 hours and after scarification on the shaven skin, in 5 days. Moreover, in the rabbit inoculated by the skin route a spinal ganglion showed, on section, the cytological changes described by HURST as characteristic in Aujeszky's disease, *viz.*, disappearance of the Nissl substance, eosinophilic staining of the protoplasm, invasion of the nucleus by acidophilic granules and alteration in or loss of the nucleolus.

The authors consider the death of the cat to have been due to Aujeszky's disease and base their diagnosis on the following points:

(*a*) Although the cat during its illness did not appear to have suffered from "mad itch", nevertheless rabbits inoculated with its medulla showed intense pruritus as a prominent symptom.

(*b*) Although, on section of the cat's brain, cell inclusions resembling Negri bodies were found in Ammon's horn, such finding is not frequent in the brains of normal cats.

(*c*) Neuronophagy and perivascular infiltration are more marked in Aujeszky's disease than in rabies.

(*d*) The incubation period in intracerebrally inoculated rabbits was of very short duration (1–3 days).

(*e*) The histopathological examination of a spinal ganglion, removed from a rabbit, which had been inoculated by the scarification method and had died in 5 days, revealed a cytology described by HURST [this *Bulletin*, 1934, v. 31, 146] as characteristic of AUJESZKY's disease.

[The diagnosis is further supported by clinical signs in the affected cat: abrupt onset and rapid development of illness, profuse salivation and short paralytic stage soon before death.] *G. Stuart*

RELOVA, R. N. **The Efficacy of our Local Anti-Rabies Vaccine.** *J. Philippine Med. Ass.* 1948, Mar., v. 24, No. 3, 129–33, 1 graph.

The anti-rabies vaccine prepared by the Department of Health's laboratories at Manila consists of a 1 per cent. suspension of fixed virus goat brain and spinal cord in distilled water containing 0·5 per cent. phenol. Such phenolized suspension is kept in the refrigerator for 5 or 6 months before use.

In the paper under review the author provides experimental proof of the vaccine's efficacy—its antigenicity, as determined by the HABEL mouse test, being invariably in excess of the National Institute of Health's minimum requirement for anti-rabies vaccines on sale, *viz.*, 1,000 MLD protection.

G. Stuart

MALARIA

MONACI, V. L'esacerbazione dell'endemia malarica e l'anofelismo nel territorio di Venezia. [**Increase of Malaria Endemicity and of Anopheline Prevalence in the Neighbourhood of Venice.**] *Riv. di Malariologia.* 1947, Aug., v. 26, No. 4, 191–211, 1 map & 1 chart. English summary (9 lines).

After an epidemic of malaria in 1929 in which 10,084 cases were reported in the Venice Province the incidence of the disease declined rapidly. The annual number of cases reported in that province in each of the four years 1937–1940 approximated 2,400. Thereafter there was a greatly increased prevalence, 4,730 cases in 1941, 9,286, 12,105, 13,772 and 11,233 in the succeeding years to 1945. From July 1943 to August 1944, the author carried out an anopheline survey of the area. Catching stations were established, both dwelling houses and stables, at distances of one kilometre along the courses of the Rivers Livenza-morta, Sile, Lemene, Piave nuovo and Gorgonze and the Canale di valle. Estimations of the saline content of waters were also made. *A. sacharovi* and three races of *A. maculipennis* were found, *messeae*, *maculipennis* and *melanoon*. *A. sacharovi* was found where endemic malaria was most severe.

Norman White

DE NEGRI, U. Sorgenti metanifere e malaria nel Polesine. (Nota preventiva). [**Marsh Gas Borings and Malaria in Polesine.**] *Riv. di Malariologia.* 1946, Dec., v. 25, No. 6, 217–23, 1 fig. & 1 map.

In 1934 the sinking of a bore in the Donada Commune of the Province of Venice, with the object of finding a supply of drinking water, failed in its purpose but disclosed the presence of marsh gas, methane, at a depth of 124 metres, and of still greater quantities at 265 metres. Subsequent exploration revealed the abundance of this source of methane and the possibility of utilizing the gas for industrial purposes. The abundance of the gas, the growing demands of industry, and the scarcity of fuel occasioned by the war resulted in large-scale developments. At the present time there are more than 60 centres of exploitation, each of them containing a number of bores, up to 20 to 25 in some cases. Their depth varies from 200 to 300 metres. More than half the total of more than three hundred bore-holes are situated in the Po Delta.

With the gas is a gush of a large quantity of water having a saline content of from 14 to 24 per cent. NaCl. This has resulted in raising the saline content of near-by collections of water making them more favourable for the breeding of *A. sacharovi*, the most formidable vector of malaria in this part of Italy. Thus arose an important factor determining the markedly increased prevalence of malaria that characterized the war years. Other operative factors were the dispersal of population caused by the dangers of bombing; the artificial flooding of certain areas for purposes of defence; neglect of maintenance of canals; reduced antimalaria staff; scarcity of larvicides, and reduced resistance of the population occasioned by malnutrition, etc.

The elimination of the malaria hazard caused by methane bores should not be difficult. The salt water could be drained through pipes to discharge in water courses of sufficient volume to reduce the salinity to an insignificant level.

Norman White

SCHWETZ, J., BAUMANN, H. & FORT, M. Nouvelles recherches sur la répartition des anophèles et du paludisme endémique au Congo Belge. I. Région du Lubilash-Sankuru. [**The Distribution of *Anopheles* and of Endemic Malaria in the Belgian Congo. I. The Lubilash-Sankuru Region.**] *Ann. Soc. Belge de Méd. Trop.* 1947, Sept. 30, v. 27, No. 3, 289–313, 1 map.

A tour in the Lubilash-Sankuru basin to study the problem of schistosomiasis gave an opportunity for the observations on the distribution of *Anopheles* and malaria in the region, which are here recorded. The area lies in the Kabinda District in the Lusambo Province, some 700 to 1,000 metres above sea level, between 5° and 7°S. Apart from Kabinda which is on the Lurimbi River, a tributary of the Lomami, all the other places referred to in the report are in the Lubilash-Sankuru basin.

Anophelines identified in the region, in their order of frequency, were: *A. funestus, A. gambiae, A. marshalli* var. *moucheti, A. nili, A. brunnipes, A. paludis, A. obscurus*. All but the first three species were rare or very rare. *A. funestus* was more prevalent than *A. gambiae*, which is unusual in most parts of the Congo.

In all 1,708 Africans were examined. A relatively high percentage of these harboured malaria parasites, but the number of parasites in the infected was usually few. *P. malariae* was everywhere very prevalent, notably in the children. *P. vivax* was only seen once, in a child in Kabinda. The endemic malaria of the region is of only moderate intensity. *Norman White*

SCHWETZ, J, BAUMANN, H. & FORT, M. Nouvelles recherches sur la répartition des anophèles et du paludisme endémique dans diverses régions du Congo Belge. II. L'entre Kundelungu et Kibara. (Territoire de Sampwe, province du Katanga.) [**The Distribution of *Anopheles* and of Endemic Malaria in various Regions of the Belgian Congo. II. The Region between the Kundelungu and Kibara Mountains in the Katanga Province.**] *Ann. Soc. Belge de Méd. Trop.* 1947, Sept. 30, v. 27, No. 3, 315–31, 1 map.

The area concerned in this survey lies between two mountain ranges in Katanga, the Kundelungu and the Kibara, lat. 9°S. These mountains attain a height of 1,800 metres. The land between is very hilly, and has a mean altitude of about 900 metres, but some places examined were considerably higher than this. Most places were examined at the beginning of the dry season. Anophelines identified included *A. funestus* which was very common, *A. gambiae* which was common and four very rare species *A. coustani, A. squamosus, A. pretoriensis* and *A. concolor*. Several specimens of *A. concolor* were captured at a height of 1,700 metres.

The blood of 677 persons was examined in 11 localities. A significant fact was the complete absence of *P. vivax* which is generally an indication of low endemicity. *P. malariae* on the other hand was found everywhere, especially among children. *Norman White*

COLLIGNON, E. La campagne antipaludique de 1946 dans le département d'Alger. [**The Antimalaria Campaign of 1946 in the Algiers Department.**] *Arch. Inst. Pasteur d'Algérie.* 1947, Sept.–Dec., v. 25, Nos. 3/4, 199–205.

The year 1946 was characterized by malaria of unusual intensity in the Algiers Department; such exacerbations occur every six to ten years. Lack of transport prevented the usual amount of epidemiological investigation

Late spring rains were the prime cause of the epidemic : rainfall in March, April and May was 108 mm. in excess of the mean fall, 179 mm., for these months. *A. maculipennis* was abundant, and the persistence of water in the summer, in the upper reaches of rivers, caused an unusual density of *A. hispaniola*. The premunition of the population had weakened owing to lessened chances of reinfection during preceding years when malaria had been little in evidence, to debility caused by other diseases and to under-nourishment. *P. vivax* infections were most in evidence. *Norman White*

STRAHAN, J. H. **Malaria in Sarawak.** *Med. J. Malaya.* 1947, Dec., v. 2, No. 2, 83–92, 5 charts & 2 maps. [13 refs.]

The author carried out a rapid survey of coastal and inland malaria in Sarawak in December 1946. Before recording the results of that survey, he summarizes previous reports concerning malaria in that country. [For information concerning malaria in Borneo, see this *Bulletin*, 1946, v. 43, 516 & 1,000.]

From May till November 1946, simultaneous epidemics of malaria occurred along the coast of Sarawak at the mouth of the Kuching River, Bintulu, Miri, Lutong, and at Kuala Belait and Seria in Brunei. These were aggravated by migrations of population. The epidemics were severe in type ; the Kuching area had to be evacuated. In Miri and Lutong, malaria was epidemic to some degree in 1945 but the incidence fell to a low level in December and remained low until April 1946. Thereafter there was a very rapid rise until October, when the disease was reported as being out of control ; the entire population was sick. The epidemic here was almost entirely due to *P. falciparum*. In the Kuala Belait and Seria epidemics, *P. vivax* was most in evidence. The Malay communities suffered much more than the Chinese ; the latter are said to have become ' mepacrine conscious ' to the extent that they are willing to purchase the drug. Malays made no attempt at self protection. Spleen and parasite rates of Malay school children were found by the author to be more than twice as high as the Chinese school rates.

Low rainfall in July, August and September allowed brackish water to infiltrate far up the Miri and Lutong Rivers and their tributaries ; intense *A. sundaicus* breeding resulted. Moreover in 1946 spring tides flooded an area ravaged by war, with defective drainage, broken tidal gates, ponds and swamps.

It is suggested that while *A. leucosphyrus* and *A. umbrosus* may transmit malaria along the coast, *A. sundaicus* is responsible for epidemic manifestations and this by reason of intense breeding rather than of its high infectivity. Further investigation is necessary to determine the importance of *A. leucosphyrus* and *A. umbrosus* as vectors. *Norman White*

FLOCH, H. L'endémo-epidémie palustre en Guyane française. [**Endemic and Epidemic Malaria in French Guiana.**] *Institut Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 163.* 1947, Oct., 12 pp.

The author has previously reported on the endemic indices of malaria in parts of French Guiana [this *Bulletin*, 1946, v. 43, 704]. In the present publication, he reports further observations made in 1946 and groups them with previous findings so as to give an over-all picture of malaria prevalence in that colony.

The spleen indices of 14 localities are listed : they all refer to school children, 3,031 in number. Very low spleen rates were found in Cayenne, 2 per cent. and in St.-Laurent-du-Maroni, 8 per cent. Other rates vary from 13 in Souvenir

to 60 in Cokioco and in Haute Mana et Haut-Approuague, respectively. Parasite rates run more or less parallel from 5 per cent. in St.-Laurent-du-Maroni, 6 in Cayenne to 46 per cent. in Cokioco.

P. falciparum is everywhere more prevalent than *P. vivax*. This is interesting in view of the fact that in 1917 Marcel Leger reported that 68 per cent. of all infections were due to *P. vivax* and only 28 per cent. to *P. falciparum*. Over a period of 8 recent years positive blood examinations have revealed the presence of *P. falciparum* in 81 per cent., *P. vivax* in 17 per cent. and *P. malariae* in 1·5 per cent.

Gametocyte indices, Ross's endemic indices and splenometric indices are calculated for each region. They all show that Cokioco, Corossony and Haute Mana and Haut-Approuague are highly malarious; most of the coastal communes are also very malarious, Iracoubo, Regina, Sinnamary, Kourou, St.-Georges, Ouanary, and Mana. Endemicity is very low in Cayenne, Saint-Laurent and in the Souvenir area. Malaria is likewise but little prevalent among the Galibi Indians of the villages of Couachi and Iracoubo.

The annual epidemic of malaria in French Guiana occurs in the dry season.

Twenty-one species of *Anopheles* have been identified in French Guiana. *A. darlingi* constituted 91 per cent. of the total captured in houses: its season of greatest prevalence, June to August, is the epidemic malaria season. *A. aquasalis* accounted for 46 per cent. of the captures outside human dwellings.

Norman White

CASTILLO, R. Répartition du paludisme en Equateur. [**Distribution of Malaria in Ecuador.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 1/2, 28–31.

The author gives a general account of the malaria problems of Ecuador.

The country is divided into three clearly defined zones. Along the west coast is a region of low-lying plains. The most important anopheline is *A. albimanus*, and the population is highly infected with malaria. Transmission occurs in the six rainy months, and particularly at the end of this period when rivers dry up and leave chains of pools. The second zone lies between the two main chains of the Andes. The altitude is above 3,000 ft. and it is said that mosquitoes occur up to 8,000 ft., but the upper limit of native malaria is not stated. In this zone the principal vector is *Anopheles pseudopunctipennis rivadeneirai*. It occurs in hot valleys, presumably at a considerable altitude. In a part of this zone, the valley of Chillos, this insect has been completely eradicated (method not stated). The malaria in this zone in the Andes is clinically very grave.

The third zone lies to the east of the mountains in the upper part of the Amazon basin. There are very large marshes, and to the east one descends into a moist equatorial climate. Important vectors are *Anopheles* (*Kerteszia*) *boliviensis*, living in water holding plants (Bromeliads). In the marshes *A. darlingi* is the prevalent vector.

All parts of the country are malarious, and the disease is a major problem in many areas.

P. A. Buxton

CORRADETTI, A. Aspectos del problema malárico mundial y medios para su solución en la Costa del Perú. [**Aspects of World Malaria: Means of dealing with the Malaria Problem in the Coast of Peru.**] Publicaciones de la Dirección General de Salud Pública. Departamento de Malaria. 1947, Apr. 11, 15 pp.

SALISBURY, E. I. **Food and Malaria.** *Amer. J. Trop. Med.* 1948, May, v. 28, No. 3, 349–58, 2 charts.

A general discussion.

SHUTE, P. G. & MARYON, M. **A Study of a Strain of *Plasmodium falciparum* Indigenous to the Belgian Congo.** *Ann. Soc. Belge de Méd. Trop.* 1947, Dec. 31, v. 27, No. 4, 391–410, 8 charts.

The authors observed the characters of a strain of *Plasmodium falciparum* isolated from a man who had recently returned to Europe from the Belgian Congo. Parasites in this patient were scanty in number and the species to which they belonged could not be diagnosed. Three people were inoculated, each one from the foregoing, and they all developed the disease after 9, 12 and 8 days respectively. Small quantities of paludrine, mepacrine and quinine were administered both in the primary attacks and in the recrudescences (recrudescence=a return of fever within 8 weeks of the previous attack). The type of fever was usually quotidian, but one patient developed a typical tertian periodicity in his first recrudescence.

The asexual parasites were confined to ring forms which varied in size from one-sixth to one-half the diameter of the host cell. Double dots of chromatin were present in some cases in 51 per cent. of the rings and this high incidence occurred in a primary attack. The double dot sometimes comprised one large chromatin dot and a second very small one, the latter occasionally being divided into two. In the largest rings, particles of fine pigment could be demonstrated by soaking the stained film in 25 per cent. alcohol for a few minutes.

No stippling of infected erythrocytes was seen until the signet ring stage was reached. Then it showed up as a mixture of dots, streaks and loops rarely exceeding 12 in number. Later the stippling becomes coarser and includes also unshaped blotches. The stippling was sometimes observed in uninfected cells and the authors suggest that such cells had probably been invaded by the parasites which subsequently vacated them.

No developing forms were observed in any of the three infections. Gametocytes were present 12, 13 and 10 days respectively after the attack. Early treatment inhibited the production of sexual forms and in such cases gametocytes were more numerous in the untreated recrudescences. Females outnumbered males by about 20 to 1. Up to 4,000 gametocytes per cmm. occurred in one of the cases. This patient was fed upon by over 200 *Anopheles maculipennis atroparvus* on six days, but although oökinetes formed normally in the gut after 24 hours, no oöcysts developed and not a single mosquito became infected. This result is similar to SHUTE's earlier work [this *Bulletin*, 1941, v. 38, 176] on African strains of *P. falciparum*, all of which failed to infect this species of *Anopheles* in contrast to European strains of the parasite.

A useful note is included on the technique of staining, which the senior author has done so much to perfect. 0·15 gm. of Baird & Tatlock's Leishman's crystals are added to 100 cc. of acetone-free methyl alcohol. The mixture is shaken 2 or 3 times in 24 hours. Three or four drops of stain are put on the thin film, and after 15 seconds, double or treble the quantity of distilled water is added. The stain is allowed to act for 20 minutes and is then quickly washed off. The distilled water is prepared as follows :—Put some distilled water of *p*H 7·2 (from lithium carbonate) in a Petri dish and expose for 20 minutes. Then retest the *p*H with phenol red. If it has become acid add more lithium carbonate to bring the *p*H back to 7·2 and then use this water. The staining must be carried out in a place free of Bunsen burners or gas fires. This method is guaranteed to demonstrate stippling and its importance in diagnosis cannot be over-emphasized.

[Such studies on strains of *P. falciparum* are of the greatest importance, for it is only by work of this kind that the complex problem of the different strains, or alleged varieties, of this species of malaria parasite can be solved.]

P. C. C. Garnham

DELBOVE, P. Fréquence relative du *Plasmodium malariae* dans les régions d'hyperendémicité palustre du sud indochinois, en l'absence de toute prémunition. [**Relative Frequency of *Plasmodium malariae* in Hyperendemic Regions of Malaria in Southern Indo-China in the Absence of Premunition.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 3/4, 188.

GANGULI, N. **Preliminary Note on Investigation of Malaria in Bengal-Orissa Border, South of Khargpur.** *Indian J. Malariology.* 1947, June, v. 1, No. 2, 289–300, 1 map & 1 chart.

This preliminary report deals with a malaria survey of a stretch of the Bengal Nagpur Railway line from Khargpur in Bengal southward to Rupsa in Orissa. This area has a laterite soil intermingled with alluvium. The slope of the land is from west to east. The railway crosses two rivers, Kaliaghai and Subarnarekha, both of which flow into the Bay of Bengal. The villagers are for the most part engaged in rice cultivation. The annual rainfall is from 60 to 70 inches ; most rain falls in July and August.

The seasonal incidence of malaria is from August to December with a peak in October. Near Khargpur, spleen rates of children from 2 to 10 years of age were very high, 82 to 85 per cent. Further south the spleen rates varied from 37 to 85 per cent.

Routine adult anopheline catches were made once a fortnight from selected catching stations along the line from August 1944 to December 1945. The following species of *Anopheles* were identified : *A. hyrcanus* var. *nigerrimus*, *A. barbirostris*, *A. culicifacies*, *A. varuna*, *A. aconitus*, *A. subpictus*, *A. vagus*, *A. ramsayi*, *A. annularis*, *A. philippinensis*, and *A. pallidus*.

A. philippinensis was only captured in dwellings, never in cattlesheds : they were found resting in dark places of houses at all hours of the day. A total of 792 *A. annularis* was dissected ; none was infected. Of 294 *A. philippinensis* dissected 12 were infected, 5 with oöcysts, 7 with sporozoites. Most infected specimens were found in September and October, the height of the malaria season. *Norman White*

WEATHERSBEE, A. A. & FROHNE, W. C. **The Relationship between Infectiveness and Densities of *Anopheles quadrimaculatus* in a Malarious Area in South Carolina.** *J. National Malaria Soc.* 1948, Mar.; v. 7, No. 1, 59–64, 1 fig.

The authors begin their paper with the statement that the density of the *Anopheles* vector is considered a major factor in the transmission of malaria. The fallacy of this proposition is revealed by their own observations in Carolina. They show that infected specimens of mosquitoes may be recovered when the general anopheline density is exceedingly low, and they are forced to the conclusion that it is impossible to determine the minimum density of *Anopheles quadrimaculatus* necessary for maintaining malaria transmission.

The infectivity rates were low, 0·17 per cent. in 1945, and 0·07 per cent. in 1946. The malaria rate in human beings for 1945 was rather less than 10 per cent. for 1945 and about 1 per cent. in 1946. Half the area under investigation had been sprayed with 2·5 per cent. DDT (residual in houses) in 1945 and the whole area in 1946.

During these two years, 44 gland-positive *Anopheles* were found. They were all collected in mule stables. The principal interest of this paper lies in this observation, for it indicates that mosquitoes become infected outside the houses treated with DDT and it suggests that in order to prevent transmission it is probably necessary to spray outside harbourages of *Anopheles* in addition to human habitations. *P. C. C. Garnham*

DE CAPRIO, P. Considerazioni su di un caso di malaria congenita. [**A Case of Congenital Malaria.**] *Pediatria.* 1944–45, v. 52/53, 185–92. [10 refs.]

This dissertation on congenital malaria is illustrated by a case that occurred in Naples. Both parents and the infant were infected with syphilis and *P. vivax* malaria. The author discusses the possibility that syphilitic lesions of the placenta may well have facilitated the transmission of malaria infection from the mother to child. *Norman White*

SPICKNALL, C. G. & TERRY, L. L. **Combined Quinine-Plasmochin and Quinine-Pentaquine Treatment of Relapsing Vivax Malaria.** *Southern Med. J.* 1948, Apr., v. 41, No. 4, 338–41.

Twenty patients were treated with quinine-pamaquin and 22 with quinine-pentaquine. They were all suffering from *P. vivax* malaria. Thirty-two had contracted infection in the Pacific war area.

One patient received 2 gm. of quinine sulphate and 0·06 gm. of pamaquin base, daily in 3 equal doses, for 12 days. One received 2 gm. of quinine sulphate daily in 3 equal doses and 0·06 gm. pamaquin base in one dose daily for 10 days. Four patients received the same amounts of quinine with 0·04 gm. of pamaquin base in two equal doses, daily for 10 days. Fourteen patients were given daily quinine sulphate 2 gm. and pamaquin base 0·06 gm., in three equal doses, for 10 days. It was necessary to discontinue the treatment of 3 patients at the end of 5, 6 and 7 days on account of severe cyanosis and abdominal pain.

All the patients who received pentaquine received 0·06 gm. of this drug with 2 gm. of quinine sulphate daily in 3 equal doses for 14 days. It was not necessary to discontinue this treatment in any case.

Twelve patients were followed up for periods of from 12 to 18 months ; 14 patients for periods of from 6 to 12 months ; the remainder for lesser periods. There was no relapse after either method of treatment.

It is recommended that patients who receive the combined treatment be admitted to hospital and closely observed. This is especially necessary for Negroes and Orientals. *Norman White*

WARTHIN, T. A., LEVINE S. A. & EVANS R. R. **Malaria. Observations on Treatment with Chloroquine (SN 7618) and Combined Quinine and Plasmochin.** *New England J. of Med.* 1948, Apr. 1, v. 238, No. 14, 467–9, 1 fig.

During the course of a year, 125 patients suffering from *P. vivax* malaria of Pacific origin were admitted to hospital in West Roxbury, Massachusetts. All had received mepacrine while stationed in malarious areas and most had been given this drug for previous relapses. Those who were anxious to have as short a stay in hospital as possible were treated with chloroquine diphosphate, one gramme followed by 0·5 gm. eight hours later. A single dose of 0·5 gm. was given on the second and third days. Patients were usually discharged on the third day with instructions to take 0·5 gm. chloroquine every Sunday for five weeks.

Patients who had had more than five recurrent attacks of malaria and those who were prepared to spend two weeks in hospital were treated with quinine-pamaquin—0·02 gm. pamaquin naphthoate every 8 hours for 14 days ; quinine sulphate 1 gm. every 8 hours for one day, followed by 0·6 gm. every 8 hours for 13 days. The drugs were given simultaneously.

Out-patient follow-up physical examinations, with blood examination for parasites and a full symptomatic history, were obtained every two months. Eighty-nine patients were followed for a period of from 6 to 12 months, and the remainder from one to 6 months.

Twenty-six patients were treated with chloroquine ; nine had acute relapses within 3 months. One relapsed 7 months and one 9 months after treatment. Eleven other patients complained of slight symptoms suggestive of relapse but self-medication was responsible for negative blood findings. The total failure rate was 84 per cent., similar to the rate following mepacrine treatment.

Of 63 patients treated with quinine-pamaquin who were followed from 6 to 12 months none showed a ' laboratory relapse ' but 16 stated that they had had symptoms suggestive of an attack of malaria. No laboratory relapses occurred among 40 other patients followed for less than 6 months.

The authors found that in the treatment of acute malaria relapses and for suppressive therapy, chloroquine was as effective as mepacrine ; moreover, it was better tolerated and does not have the yellow-dye discoloration effect of mepacrine. It is, however, no more effective than mepacrine in preventing relapses. Quinine and pamaquin combined, under controlled observation and restricted activity of the patient, afford a safe and effective means of reducing the relapse rate. *Norman White*

ADHIKARI, A. K. **Suppressive Mepacrine Treatment to the Staff of B.A. Railway in 1945.** *Indian J. Malariology.* 1947, June, v. 1, No. 2, 337–45, 2 graphs.

During the malaria transmission season of 1945 and for one month after, an attempt was made to give one tablet of mepacrine a day to each employee of the Bengal Assam Railway. This demanded an organization of considerable magnitude, for the staff numbered some 48,000 in 135 stations. In areas where *A. minimus* was the carrier the administration extended from April to November inclusive. In *A. philippinensis* areas the drug was given from June to January. The results appear to have been highly satisfactory. There was a very considerable reduction in malaria incidence and general sickness rates as compared with previous years. Not a single case of blackwater fever was encountered ; in previous years several cases occurred. No death from cerebral malaria was recorded. *Norman White*

MAIER, J. **Quinacrine Levels in Plasma of Persons with Infectious Jaundice during and after Suppressive Malaria Therapy.** *Amer. J. Trop. Med.* 1948, May, v. 28, No. 3, 395–6.

" The plasma level of quinacrine during its administration for the suppression of malaria, and the rate of disappearance of the drug from the plasma after the treatment was stopped, were normal in patients with infectious hepatitis."

LAHIRI, S. C. **Paludrine in Malaria—Clinical Observations.** *J. Indian Med. Ass.* 1947, Nov., v. 17, No. 2, 27–32.

The author reports on the treatment with paludrine of 36 patients suffering from acute malaria. There were 31 *P. vivax* and 5 *P. falciparum* infections. The results were comparable to those obtained with adequate doses of mepacrine. No toxic effects were noted. One-day single-dose method of treatment is not considered satisfactory. The dosage found satisfactory by the author was 0·2 gm. twice daily for 4 or 5 days, and then one similar or smaller dose daily until a total of 3 gm. had been taken. *Norman White*

VISWANATHAN, D. K. & BAILY, J. D. **Experiments with Paludrine in the Chemotherapy of Malaria.** *Indian J. Malariology.* 1947, June, v. 1, No. 2, 307–28.

These observations were carried out in the Bombay Presidency. In Ahmedabad, Visapur and Belgaum the study was confined to the jail populations.

In the two former places malaria is moderately endemic, the transmission season extending from September to January ; Belgaum has little indigenous malaria. Some observations were also carried out in a few villages in the Kanara District where malaria is hyperendemic. The results are recorded in great detail. It was found that paludrine in weekly doses of 100 mgm. for adults, 50 mgm. for children aged 5 to 12, and 25 mgm. for children aged 2 to 4, gave satisfactory results as a clinical prophylactic. These doses were not absolutely effective, however, and their administration twice weekly is recommended. A single dose of 300 mgm. effects clinical cure in all three forms of infection. Gametocyte production continues after clinical relief and the disappearance of asexual parasites from the peripheral blood : after 8 weekly doses of 100 mgm. the gametocytes show degenerative morphological changes. In rural areas, clinical prophylaxis with weekly doses is not practicable, but for the treatment of clinical attacks in such areas paludrine, 300 mgm. in single doses, is most valuable (smaller doses for children). Tablets might safely be left in the hands of lay village officers for distribution. *Norman White*

Mullick, K. B. & Gupta, J. C. **Intravenous Paludrine in Malaria.** *Indian Med. Gaz.* 1947, Nov., v. 82, No. 11, 666–8.

The authors report the use of intravenous injections of a solution of paludrine in the treatment of malaria. The solution was made in bulk : 50 gm. were dissolved in 2,500 cc. of normal saline. The solution was left in a tall jar for 24 hours ; the clear supernatant fluid was siphoned off and autoclaved for 30 minutes under 20 lb. pressure ; 15 cc. were injected intravenously.

There were no immediate reactions in any of the 50 patients so treated. In only five cases was a second injection called for ; this was given on the following day. Four patients complained of anorexia and 3 of insomnia, but it was not possible to determine whether paludrine was responsible for these symptoms. *Norman White*

Chou, T. Q., Fu, F. Y. & Kao, Y. S. **Antimalarial Constituents of Chinese Drug, Ch'ang Shan,** *Dichroa febrifuga* **Lour.** *J. Amer. Chem. Soc.* 1948, May, v. 70, No. 5, 1765–7.

" From the Chinese drug, Ch'ang Shan, identified as *Dichroa febrifuga* Lour., there have been isolated umbelliferon, 4-quinazolone, a base with the composition $C_{18}H_{23}O_3N_3$ and a water soluble alkaloid named dichroine. The last compound has the composition $C_{16}H_{21}O_3N_3$ and undergoes easily isomeric change with the formation of three isomerides which are provisionally named α- β- and γ-dichroines, being convertible into each other under suitable conditions. Regarding their antimalarial activity, the γ-isomeride shows the greatest, and the α-isomeride the least. Based on the results of oxidation and alkaline hydrolysis, dichroine appears to be composed of 4-quinazolone and a pyrole derivative which requires further investigation. Dichroine forms both normal and acid salts and a nitroso compound. The isolation of 4-quinazolone from a natural plant, Ch'ang Shan, affords a remarkable coincidence with the chemical research for antimalarials along this line." [See also this *Bulletin*, 1948, v. 45, 578.]

Castana, V. & Milani-Comparetti, P. Studi sulla splenoriduzione nella malaria con sympatol e adrenalina. [**Reduction of Splenomegaly of Malaria with Sympatol and Adrenaline.**] *Riv. di Malariologia.* 1947, June, v. 26, No. 3, 137–52. [16 refs.] English summary (5 lines).

The authors report on the treatment of 72 patients suffering from malaria by a modified Ascoli method : sympatol was used in place of adrenaline. The

intravenous injections were associated with the administration of the usual antimalarial drugs. Sympatol was shown to be preferable to adrenaline in all respects. It was easier to administer; the immediate symptoms following injection, pallor, tachycardia, the feeling of constriction in the chest, headache, etc., were much less marked and more transient with sympatol; the contraction of the spleen was more prolonged; the number of injections necessary is much less than the thirty daily injections of adrenaline, in graduated doses, advocated by Ascoli. In most cases, 6 or 7 intravenous injections of sympatol were sufficient to obtain comparable results. Only in exceptional cases, in which the reduction of splenomegaly was delayed or incomplete, were 8, 10 or 12 injections required. *Norman White*

HENRY, A. F. X. Prémunothérapie catalytique du paludisme subaigu et du paludisme chronique. Parasitolyse partielle et hémochromatophénol. [**Catalytic Premunotherapy of Subacute and of Chronic Malaria.**] *Riv. di Malariologia*. 1947, June, v. 26, No. 3, 115–36. [Refs. in footnotes.]

Sufferers from subacute or chronic malaria and patients who, through stress of circumstances, have lost their state of premunition to malaria, derive the utmost benefit from undergoing a cure in certain hydromineral establishments such as that of Encausse les Thermes (Haute Garonne), if that cure be reinforced by appropriate chemical treatment. The state of premunition may be very rapidly regained. The treatment appears to exercise a catalytic action on all the bodily forces, various glands and the reticulo-endothelial system. In an endeavour to find other means of modifying the interaction of host and parasite, the author turned his attention to autohaemotherapy. He has evolved a method of treatment for which he claims great success.

The chronic malaria patient is given preliminary treatment—a daily injection of from 0·8 to 1·0 gm. of quinine for 3 days, and 3 tablets of premaline on each of the two succeeding days. Two days after this treatment, some 50 to 70 cc. of blood are withdrawn. The blood is added to distilled water, 10 cc. blood to 50 cc. distilled water. (The blood should give a clearly positive melanoflocculation test and contain no parasite in thick smears). The blood in distilled water is left at room temperature for 7 or 8 hours and then placed in a refrigerator till the following day. It is then centrifugalized: the clear red fluid is decanted and placed in graduated bottles. Carbol thionine is then added, 0·5 cc. to 40 cc. of haemolysed blood solution (thionine 2 gm., carbolic acid 8 gm., water 1,000 gm.). After mixing well it is left for 4 hours. Saline solution, 15 per 1,000, is then added, in amount equal to one-quarter of the volume of the haemochromatic fluid. Carbolic acid 5 per cent. is added to the saline solution before mixing, the amount being one-tenth of the combined volume of saline and haemochromatic solutions. A final centrifugation completes the preparation, to which the name haemochromatophenol is given.

Haemochromatophenol is administered subcutaneously; the dose for an adult is 30 cc. An injection is given on each of three successive days, the first being given 36 hours after the withdrawal of blood. Three or four days after the third injection, a fourth and last injection is given. In most cases one series of injections is sufficient. In cases with very large splenomegaly, a second series may be necessary when the whole process is repeated.

Spectacular results have been obtained—" a veritable catalysis of organic activity ". The author discusses at considerable length the possible contribution of each of the various elements of the treatment to the success achieved.

Norman White

HEILBRON, I. **The Rôle of Chemistry in combating Tropical Diseases.** *Nature.* 1948, June 19, 956–60.

A review of modern work on chemotherapy and insect control in malaria and trypanosomiasis.

COVELL, G. **Bats, Clover, Water Lettuce and Malaria.** *Indian J. Malariology.* 1947, June, v. 1, No. 2, 243–51. [27 refs.]

This paper deals with three theories concerned with the prevention of malaria that have received wide publicity from time to time in the lay press. None of them has stood the test of serious investigation.

Bats as potential destroyers of mosquitoes on a large scale came into prominence in 1909 as a result of the advocacy of Dr. Campbell of Texas. Attempts to turn his observations and claims to practical account have invariably failed, but his ideas have had recent adherents.

The suggestion that clover might have antimalarial properties originated from d'Herelle. He thus explained the absence of malaria from areas in which clover is abundant. He suggested that coumarin ingested by the female mosquito from clover might inhibit the development of the malaria parasite. Investigation has shown that clover has no effect on the incidence of malaria, but d'Herelle's theory has recently received influential advocacy.

The water lettuce (*Pistia stratiotes*) according to Dr. Roy of Murshidabad, Bengal, was always present in local water collections in his district wherever malaria was prevalent and absent from all healthy areas. The removal of the weed from highly malarious villages had completely eradicated malaria. Investigation has conclusively shown that Dr. Roy's theory is untenable.

The lesson to be learned from all this is epitomized in the dictum of Darwin which heads this paper: "The most hazardous of human tendencies is the drawing of general conclusions from limited experience". *Norman White*

INDIAN J. MALARIOLOGY. 1947, June, v. 1, No. 2, 253–77. **Report of a Committee convened for the Co-ordination of Policy regarding the Prevention of Malarial Conditions produced during the Construction of Roads and Railways** [COTTER, E., Chairman].

A Committee composed of engineers and malariologists considered memoranda dealing with features in railway and road construction that are likely to create conditions favouring the incidence of malaria, and with the measures that might be taken to prevent such conditions from arising. These memoranda are reproduced as appendices to this paper. The Committee recommended that the provision of culvert openings under railway and road banks should be more liberal than is the existing practice and should be sufficient to provide for periodic heavy rainfall. Culverts should be so designed that a lowering of the invert levels by approximately 5 feet could be effected, if required, without endangering the stability of the structure. Borrowpits should be prohibited in built-up areas and for half a mile from their limits. Elsewhere, if earth cannot be obtained from another source, specifications are laid down for the construction of borrowpits. Adequate provision for their drainage into a natural drainage channel should be made. Interconnecting drains between borrowpits should be at least five feet wide; their margins should be kept straight. Particular care is required regarding the siting and depth of borrowpits in hilly country on account of the danger of tapping seepage outcrops. Adequate drainage should be provided for quarry-pits and cuttings wherever these expose seepage outcrops. Measures for the protection against malaria of all persons engaged in railway and road construction should be enforced: these measures are

detailed. All engineering projects should make provision for necessary anti-malaria works ; a definite proportion of the cost should be earmarked for this purpose. *Norman White*

SEPULCRI, P. La campagna antimalarica con il D.D.T. nel 1946 nelle provincie venete. [**Antimalaria Campaign with DDT in 1946 in the Provinces of Veneto.**] *Riv. di Malariologia.* 1947, Aug., v. 26, No. 4, 163–82, 2 maps (1 folding) & 6 charts. English summary.

There was a large increase in the incidence of malaria in the Veneto Provinces during the war years : 20,629 cases were reported in 1944–45 as compared with 4,669 in 1938–39. In 1946, UNRRA collaborated with the Health Department in a DDT campaign. The greater part of the three most malarious provinces, Rovigo, Venice and Udine, were treated. A 5 per cent. solution of DDT was used for spraying. Some 16,000 houses containing 196,000 rooms were treated between May 6th and August 9th. The malaria morbidity was 50 per cent. lower than in the previous year. Primary malaria infections numbered 1,687 compared with 4,443 during the same period of 1945. The 1946 figure includes cases from some areas that were not treated. *Norman White*

LIVADAS, G. A., BELIOS, G. D., KOROGHIANNAKI, P. & VALLA, C. **Results of Malaria Control Activities in Greece during 1946 on Basis of Epidemiological Data.** *Arch. d'Hygiène.* Athens. 1947, Apr.–Dec., Nos. 4/12, 115–28.

The large-scale antimalaria campaign with DDT carried out in Greece in 1946 has been described previously [this *Bulletin*, 1948, v. 45, 492]. On the conclusion of that work an extensive survey was carried out in Epirus, Continental Greece, Peloponnese and the Islands with the object of assessing the results achieved. This report gives the results of that survey. In the above areas, 5,933 school children were examined to determine the parasite index and 3,495 to determine the spleen index. Blood smears were also taken from 295 babies born between the close of the 1945 malaria season and the autumn of 1946. Of the 90 surveyed areas, 79 had been ' protected ' during the 1946 malaria season, in 55 with DDT spray against adult mosquitoes only and in 24 with DDT spray combined with larva control by ground methods. Some of the 79 areas also profited by the airspray programme in nearby swamps. Most surveyed areas were small villages. For the findings in 37 protected areas, data of previous years served as a basis of comparison. In these the spleen rates averaged little more than half the previous rates recorded. The parasite rates of 58 protected areas averaged 2·1 per cent. compared with 20·6 per cent., the average of previous recorded rates. In 3 non-protected areas, the parasite rates were higher than previously recorded rates. Of 284 babies examined in 26 of the protected areas, only one was found infected.

The Malaria Control Service Laboratory in Salonika reported a remarkable decrease in the number of positive blood smears examined. Malaria morbidity in the army also showed a remarkable decline compared with previous years.
Norman White

LIVADAS, G. A. **Malaria Control in Greece during 1947.** *Arch. d'Hygiène.* Athens. 1947, Apr.–Dec., Nos. 4/12, 129–33.

The successful DDT antimalarial campaign in Greece in 1946 provided experience that was turned to profitable account in 1947. The spraying of houses and outbuildings was started on March 15 and by the end of July, 4,617 villages, with a population of 2,802,500, had been treated. For houses

an emulsion prepared by mixing one part of a 26 per cent. oil solution of DDT with 5 parts of water was used ; in the previous year 4 to 5 per cent. oil solutions of DDT had been used. This change in the preparation used excited much adverse criticism. For some unexplained reason the house fly was much more prevalent in 1947 than in the previous year, though the control of anophelines and other insect pests appeared to be quite as effective with the emulsion as with the oil solution of DDT. Experiments regarding the resistance of flies to DDT are being undertaken.

The population under protection by the house spray method and larva control with DDT amounted to 4,236,500. *Norman White*

HUDSON, J. H. **Land Ownership and Anti-Malaria Law in Malaya.** *J. Trop. Med. & Hyg.* 1948, Feb.; v. 51, No. 2, 33–40, 2 figs.

BISHOP, E. L. & HINMAN, E. H. **Malaria Control Trends on Impounded Waters of the Tennessee Valley.** *J. National Malaria Soc.* 1948, Mar., v. 7, No. 1, 12–22, 3 figs.

In the south-eastern United States the construction of reservoirs results in an increased anophelism which in the past has caused sharp increases in malaria, the vector mosquito being *Anopheles quadrimaculatus*. A system of tributary and main river reservoirs reaches from the headwaters to the mouth of the Tennessee River and drains a basin on which more rain falls than in any area of similar size in the United States ; the shore line of these reservoirs exceeds 10,000 miles in length ; the production of electric power and flood control are the main objectives of this extensive water project.

Based on wide experience, regulations for malaria control purposes govern the impounding of water and have for their main objective naturalistic or biological control of the vector mosquito by the development of a clear water surface. This entails careful preliminary attention to malaria control measures in the " blue-print " stage so that such measures may be " built in " or form part of the construction scheme ; provision must be made for the raising or lowering of water levels ; lastly an effective shoreline maintenance is essential. Water-level manipulation is now so well understood and applied that, together with shoreline improvements, conditions are so unfavourable for mosquito breeding as to bring very much nearer the time when repetitive measures, such as the application of larvicides, may be almost dispensed with.

In the course of reservoir construction, the adjustment of the shoreline involves such work as embankment construction, drainage (with or without pumping) of shallow-water areas, and major filling and deepening operations. Where such methods of control are impracticable or uneconomical, recourse is made to the exclusion of human habitations from the area.

After construction is completed, water level management provides control of both mosquitoes and the vegetation which supports their development. This degree of control is attained by a four-phase variation of water level :—

1. Late winter or early spring is flood time and the water level is brought to maximum elevation for the purpose of stranding the winter's accumulation of floating débris.

2. From the commencement of new spring growth until the beginning of production of *A. quadrimaculatus*, a constant high level is maintained to prevent the invasion of the mosquito season shoreline levels by fresh vegetation.

3. For some four or five weeks of moderate *A. quadrimaculatus* production, a weekly fluctuation of level operates.

4. The season of heavy *A. quadrimaculatus* production is associated with a seasonal or summer recession of the water levels. The weekly fluctuation

(1 foot) is maintained and in combination with the steady seasonal fall ($\frac{1}{10}$ foot per week), the low level of each successive fluctuation cycle results in the water being drawn sufficiently far out of the advancing vegetation growth to ensure adequate control of *A. quadrimaculatus*.

Shoreline maintenance and improvement, including control of vegetation by mechanical removal or the use of herbicides, enhances the effect of water level fluctuation. Where larvicides are necessary, DDT as an aerosol or fine spray applied by aeroplane has replaced paris green. DDT applied as a residual insecticide to all buildings, and in particular to animal and human habitations, gives greater protection to the population than routine " gauzing " of dwellings.

The progress in the methods referred to above has resulted in a substantial decline in malaria incidence among the populations adjoining the reservoirs of the Tennessee Valley Authority; " malaria prevention " better describes the status of the work than does " malaria control."

[This paper emphasizes the importance of including the engineering aspects of malaria control measures in the preliminary planning of reservoir construction. In the development of Africa, water projects may well be followed by the intensive malaria associated with *A. gambiae* and *A. funestus* unless similar measures to those of the Tennessee Valley Authority are applied from the beginning of construction. The whole project has now been described in detail in book form (see below p. 822).] *R. Ford Tredre*

GARTRELL, F. E. & KIKER, C. C. **Experience with Use of Permanent Works for the Control of Anophelines on Impounded Water.** *J. National Malaria Soc.* 1948, Mar., v. 7, No. 1, 44–58, 6 figs.

This paper gives in considerable detail with explanatory diagrams the engineering aspects of the malaria control programme for the Kentucky Reservoir of the Tennessee Valley Authority; namely the dyking and dewatering, the filling and deepening associated with the adjustment of the shore line of the reservoir. It does not lend itself to abstraction and should be read in the original. *R. Ford Tredre*

MCCAULEY, R. H., FAY, R. W. & SIMMONS, S. W. **The Importance of Coverage in DDT Residual House Spraying for Control of** *Anopheles quadrimaculatus* **Mosquitoes.** *Pub. Health Rep.* Wash. 1948, Mar. 26, v. 63, No. 13, 401–7, 1 fig.

The experiments were done to investigate the importance of thoroughness in application of residual sprays for mosquito control, with the object of determining whether a time-saving " spot " treatment could be safely employed. A series of bedrooms were chosen and divided into three groups of three. In one set, only the predictable resting places of mosquitoes were sprayed; *i.e.* undersides of furniture and pictures, the parts of walls immediately behind them, the corners of rooms and the angles between walls and ceilings (representing about 46 per cent. coverage). In another set of three rooms, the furniture was removed before spraying and only the walls and ceilings (as in routine jobs) were treated (representing 90 per cent. coverage). In the final three rooms, both procedures were adopted (100 per cent. coverage).

The insecticide used throughout was a 5 per cent. aqueous emulsion of DDT. It was applied with an air-pressure hand sprayer to give a residue of about 200 mgm. DDT per sq. ft. Testing was done after intervals of three, ten and sixteen weeks by releasing about 500 laboratory-bred mosquitoes from a cage into each closed room and counting rates of knock-down. The species employed was *Anopheles quadrimaculatus*.

The results showed that :

(1) satisfactory control cannot be achieved by the " spot " application method ;

(2) the " spot " method plus the routine wall spray gives better results than the wall spray alone ;

(3) these effects are true in regard to residual action as well as to the initial knockdown efficiency of the sprayed rooms ;

(4) efficient application is necessary for the greatest residual effect of DDT.

J. R. Busvine

FLETCHER, O. K., Jr. & KRAUSE, J. B. **Mass Destruction of Adult Anophelines by DDT as a suggested Malaria Control Measure. A Preliminary Report.** *Amer. J. Trop. Med.* 1948, Mar., v. 28, No. 2, 323–32.

Because of the very considerable difference in the cost of application of residual insecticide to habitations as compared to the field use of larvicides, the authors decided to conduct a field experiment to determine the effect on the total anopheline population of concentration on adult anopheline destruction coincident with cessation of the use of larvicides. To this end, they selected some sixteen square miles of rural area in Dougherty and Worth Counties of the State of Georgia U.S.A. (31·8°N, 84°W) ; in this area human habitations had been treated with residual insecticide (DDT emulsion), the malaria vector being *A. quadrimaculatus*. Over a period of eleven days similar treatment was applied to all likely outdoor resting places of anopheline mosquitoes ; such places included barns, stables, chicken houses, outbuildings, privies, culverts, bridges, hollow trees, the underside of dwellings and eaves ; masses of vegetation, vines, etc. were not treated. Assessment of results was attained by systematic larval counts in untreated waters within and outside the area, and by enumeration of adult anophelines found in untreated artificial shelters favourably placed throughout the area. The subsequent absence of anophelines in the treated outdoor resting places was expected, and a certain " repellent effect " contributed to that result. Despite this widespread use of DDT, the untreated artificial shelters revealed a number of anophelines, and a few larvae continued to appear in the breeding ponds. Nevertheless, in this season, which was favourable to mosquito breeding, the overall reduction of the anopheline population was such as to justify careful consideration of a concentration of finance and effort on adult anopheline destruction by the application of residual insecticide (5 per cent. DDT emulsion) as a sole measure of anopheline control. Larval populations, by comparison with untreated areas, had been reduced 89·1 per cent. by this single treatment. [Observations in this area are to continue.] The authors suggest that the results indicate that, in the districts concerned, the " outdoor " treatment alone may eventually replace " indoor " treatment and the use of larvicides.

R. Ford Tredre

CORRADETTI, A. Caracteres del problema malárico en la Costa, Sierra y Selva del Perú, y líneas generales de un plan de lucha nacional contra la malaria. **[The Malaria Situation on the Coast, in the Mountains and Forests of Peru, with an Outline of the Plan for Malaria Control throughout the Country.]** Publicaciones de la Dirección General de Salud Publica. Departamento de Malaria. 1947, Dec. 9, 8 pp.

RIPPER, W. E. & TUDOR, P. **The Development of a Helicopter Spraying Machine.** *Bull. Entom. Res.* 1948, May, v. 39, Pt. 1, 1–12, 4 figs. & 8 pls. [10 refs.]

HUFF, C. G. & COULSTON, F. **A Search for the Pre-Erythrocytic Stages of *Plasmodium vivax* and of *P. cynomolgi*.** *J. Parasitology.* 1947, Dec., v. 33, No. 6, Section 2 (Supp.), 27.

Following upon their successful investigations of the development of avian malaria parasites [this *Bulletin*, 1945, v. 42, 538] the authors made an intensive search for pre-erythrocytic stages of *Plasmodium vivax* in human volunteers. Salivary glands from infected *Anopheles quadrimaculatus* were inoculated in minimum quantities of fluid into the skin, lymph glands, muscle and isolated veins of the volunteers, and biopsies were made of the inoculated areas. No pre-erythrocytic stages were found in biopsies from 24 areas of skin, 7 lymph glands, 4 veins and 1 piece of muscle, although remnants of the inoculum were usually identified. The biopsies were taken in 2 to 150 hours, but mostly at 24, 48 and 72 hours.

Biopsies of the inoculated areas were subinoculated or grafted into other volunteers in an attempt to demonstrate viable parasites. Infections developed in all the original recipients of sporozoites but none in those receiving the biopsied areas of skin.

As pre-erythrocytic stages of some avian malaria parasites will develop in hosts which do not have parasitaemia, attempts were made to find such stages in the areas of inoculation of sporozoites of *P. vivax*: these were made in liver, spleen, bone marrow and skin of 5 species of monkeys, without success. The monkeys in question were *Macaca mulatta*, *Cercopithecus aethiops sabaeus*, *Cercopithecus a. pygerythrus*, *Cercocebus fuliginosus* and *Papio papio*.

Negative results were also obtained in the case of similar experiments with *Plasmodium cynomolgi* and the host *Macaca mulatta* at approximately 24, 48 and 72 hour intervals in specimens of liver, spleen, bone marrow and skin.

H. J. O'D. Burke-Gaffney

i. SHORTT, H. E. & GARNHAM, P. C. C. **The Pre-Erythrocytic Development of *Plasmodium cynomolgi* and *Plasmodium vivax*.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 785–95, 12 coloured figs. on 2 pls. [20 refs.]

ii. —— & ——. **The Exoerythrocytic Parasites of *Plasmodium cynomolgi*.** [Demonstration.] *Ibid.* 705 (Discussion 713–16).

i. In a series of earlier notes [this *Bulletin*, 1948, v. 45, 388, 482] and in a demonstration of pictures at a meeting of the Royal Society of Tropical Medicine and Hygiene on February 19, 1948, the senior author and his co-workers have described and demonstrated the pre-erythrocytic schizogony of *Plasmodium cynomolgi* in the liver of monkeys and of *P. vivax* in the liver of man. In the paper under review a return is made to the subject and a fuller description of the experiments on monkeys and man is given. Two facts showed that SCHAUDINN'S view that sporozoites directly entered red blood corpuscles was incorrect. The first was the remarkable difference between blood-inoculation infections and those produced by sporozoites. In the former case there is no actual incubation period, as parasites appear quickly in the blood, whereas in the latter there is a definite incubation period during which blood inoculated to clean hosts is non-infective for some days, the actual period varying with the species of parasite. At the end of this incubation period the blood becomes infective, and soon afterwards parasites are demonstrable in the blood. The second fact is the difference in the action of drugs on the blood- and sporozoite-produced infections. In blood infections antimalarial drugs may completely eradicate the infection, while in sporozoite-produced infections the parasites will make their appearance, sooner or later, in spite of drug. Researchers on

avian malaria have explained these anomalies by demonstrating the existence and nature of the tissue phase and it became obvious that a similar phase must exist in human malaria. Some observers have actually included it prematurely in descriptions of this cycle of human malarial parasites.

In the experiments, large numbers of *Anopheles maculipennis atroparvus* were fed once, twice or three times on monkeys showing numerous gametocytes in the blood. They were then kept at 25° to 27°C. at a relative humidity of over 80 per cent. and on a diet of raisins or cane sugar. After a suitable time they were then fed on a clean animal and after feeding they were ground in a mortar in heparinized monkey plasma diluted with an equal volume of normal saline solution. The suspension was then inoculated intraperitoneally or intramuscularly or in both ways into the same monkey. The feeding of the mosquitoes on the monkeys was carried out by anaesthetizing the animals with nembutal and placing them in the cage. The anaesthetic effect lasted 1 to 2 hours, during which the mosquitoes could feed without interruption. The animals so infected were examined in two ways. Either on a special day the animal was killed for post-mortem examination, or a biopsy was performed on the liver. This could be repeated frequently, so that the infection could be followed in the same animal. Haemorrhage from the cut surface of the liver was easily controlled by cautery. For fixation of tissues, many fixatives were tried but the best results were given by Carnoy's fluid (with chloroform) ; for staining, the Giemsa method described by SHORTT and COOPER (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1948, v. 41, 427)* was used.

The authors describe one of their monkey experiments and the only human experiment.

In the monkey experiment about 1,000 mosquitoes were infected with *P. cynomolgi* by three successive feeds on a gametocyte-carrying monkey. Ten days after the last feed dissection of 20 mosquitoes showed that all were infected. The surviving mosquitoes, 576 in number, were allowed to feed on a monkey. Over 500 fed. The entire batch of mosquitoes was then ground in a mortar and half the suspension was inoculated intraperitoneally and the

*The authors' description is as follows :—

" This method has the advantage of staining cells and protozoal parasites in tissue sections with colour effects resembling those seen in dry smears stained in Giemsa stain. Details of the technique are as follows :—

1. Fix in Zenker, formol-saline or other suitable fixative.
2. Embed in paraffin wax and cut thin sections.
3. Remove wax with xylol.
4. Remove xylol with alcohol.
5. Bring down to tap water.
6. *Treat section with 5 c.c. Lugol's iodine added to 30 c.c. distilled water.
7. Transfer to 95 per cent. alcohol.
8. Bring down to tap water.
9. Treat with 0·5 per cent. sodium hyposulphite for 10 minutes.
10. Wash in tap water for 5 minutes.
11. Stain for 1 hour or longer in Giemsa stain, 10 c.c. ; acetone, 10 c.c. ; methyl alcohol, 10 c.c. ; buffered distilled water, 100 c.c. (*p*H 7·2 to 7·4).
12. Wash momentarily in tap water.
13. Differentiate in colophonium resin, 15 grammes ; acetone, 100 c.c. for 15 seconds or longer, checking under the low power of the microscope. Renew solution as " film " forms.
14. Wash in acetone, 70 c.c. ; xylol, 30 c.c., with several changes.
15. Apply xylol without draining slide, then apply several fresh changes of xylol until section becomes clear.
16. Mount in green euparal."

*In the case of tissues fixed in non-mercurial fixatives, steps 6 to 10 may be omitted.

remaining half in two portions into the thigh muscles. Seven days later the monkey was killed and tissues were removed for examination. So far tissue stages have been found only in the liver.

In the human experiment 3,600 mosquitoes were infected with *P. vivax* by two successive feeds on a gametocyte-carrier and the mosquitoes were kept at 24°–26°C. at a relative humidity of 75–80 and were fed on rabbits. Fourteen days after the last infecting feed the survivors, 2,010, were fed on the volunteer (A.C.) on two successive days. In addition the salivary glands of 200 were dissected in Locke's fluid and were inoculated intravenously. Seven days later a biopsy was performed on the liver to secure, if possible, parasites of six or seven days' development.

In the *P. cynomolgi* experiments, the earliest form was seen on the 5th day, and the succeeding stages, day by day, have been found up to the 10th day. The 5th-day stage is a spherical body measuring 10·5μ. It has a blue or mauve-blue cytoplasm and purple or magenta-coloured chromatin in irregular masses. The masses followed in serial sections number about 50. The outline of the schizont is clear-cut and stands out in sharp contrast with the cytoplasm of the liver cell. The nucleus of this cell is eccentric, owing to pressure of the parasite, but as a rule is not deformed at this stage, while the staining of the cytoplasm and nucleus is unaltered.

The 6th-day stage is ovoid and measures 18μ in longest diameter and contains over 100 nuclear masses. The smooth contour of the parasite at all stages, and whatever its shape, would appear to indicate some kind of pellicle, but if this is present it is too fine to be apparent. In some sections the parasite is shrunken, leaving a clear space between it and the cytoplasm of the containing cell.

The 7th-day stage is generally ovoid, measuring 31μ in longest diameter. In some forms the outline is irregular, owing to pressure of resistant structures such as fibrous tissue or larger vessels. Some have one or more lobose arms. The parasites frequently show one or more vacuoles, which may be merely sections across indentations. The cytoplasm is coarsely granular and has a pastel-blue colour. The chromatin masses are magenta colour, are very numerous and fairly uniformly distributed. From serial sections they number from 800 to 1,000.

The 8th-day schizonts resemble the 7th-day form but there is some indication in smear preparations of condensation of cytoplasm round the nuclei. The 9th-day schizonts show some increase in size, with average diameter of 35μ. Some forms 45μ were encountered.

The 10th-day stage shows considerable change, as merozoite formation is complete. Three stages are detectable. In the first, the mature schizont contains merozoites which are kept together by the limiting membrane. Similar forms may be seen on the 9th day. In the next stage, the membrane has ruptured and the merozoites are scattered in the surrounding tissues. Each merozoite, consisting of cytoplasm and chromatin, measures 1·13μ in diameter. With this rupture of the schizont there is an immediate invasion of the parasitic area by phagocytic cells which engulf numbers of the merozoites, but some escape and invade the red blood corpuscles. The third stage represents an increase in the invading cells—monocytoid cells, polymorphonuclear cells and some plasma cells—which bring about the complete disappearance of the merozoites. These areas of infiltration by cells stand out in the otherwise normal liver tissue. Presumably the phagocytic cells eventually disappear and the area assumes its normal appearance.

In the *P. vivax* experiment, forms of the 6th and 7th day were found in the liver. The smallest forms seen corresponded with the 7th-day forms in the monkey experiments, but they were larger, being about 42μ in diameter. The

number of chromatin masses was estimated at 800. Some larger forms were encountered and in some there was indication of merozoite formation. In staining reaction, variations in shape, vacuolation and absence of tissue response, the development corresponded with that of *P. cynomolgi*. One form appeared to represent a rupture of a fully developed schizont and the escape of merozoites. It is not clear whether this is a natural rupture or a mechanical damage to a nearly mature schizont. The merozoites were smaller than those of *P. cynomolgi* and it was not possible to distinguish any cytoplasm. The assumption is made that the rupture was premature. The human subject had been subjected to malaria therapy 22½ months earlier with the same strain of *P. vivax* (Madagascar strain) induced by blood inoculation and had experienced 13 peaks of fever. When the examination of the liver revealed the schizonts it was expected that clinical malaria with parasites in the blood would develop about the 9th or 10th day. In fact there was no clinical attack beyond a transitory rise in temperature on the 15th day, and no parasites were demonstrated in the blood at any time.

In the discussion of these results it is pointed out that the work has provided a solution to the problem of pre-erythrocytic schizogony in mammalian malaria. The *P. vivax* experiment presents an interesting study in immunity. The immunity conferred by the first infection was sufficient to prevent the development of a blood infection, but insufficient to hinder the development of the sporozoites in the liver. There is evidence that a cellular reaction is responsible for the suppression of the blood infection in the invasion of the schizonts of *P. cynomolgi* by phagocytic cells. In fact, in the human liver many foci of cell infiltration, often a quarter of a millimetre in diameter, were present. These were not associated with parasites but they probably represented the final attack on pre-erythrocytic forms.

The above account of the pre-erythrocytic development of *P. cynomolgi* commences with a schizont on the 5th day. The complete development is reached on the 8th to the 10th day. The question is raised as to whether the sporozoite requires five days to grow to the size of the 5th-day schizont or whether more than one cycle occurs. While more than one cycle before the fifth day cannot be ruled out, it is assumed that it takes the sporozoite five days to grow to the size of the 5th-day schizont. Another unsettled point is the repetition of the schizogony in the liver by merozoites which enter liver cells rather than red blood corpuscles. In avian malaria two types of tissue schizogony occur. One gives rise to small merozoites—micromerozoites—and the other to larger merozoites—macromerozoites. The former are supposed to enter red blood corpuscles while the latter enter cells of the reticulo-endothelial system to maintain the exoerythrocytic cycle. The present investigations on *P. cynomolgi* and *P. vivax* have not supplied an answer to these questions. A feature of these liver infections probably explains the failure of other observers to discover the pre-erythrocytic cycle, for HUFF & COULSTON [above], Mammalian Malaria Enquiry [this *Bulletin*, 1947, v. 44, 966], SHORTT, GARNHAM and MALAMOS [*ibid.* 1948, v. 45, 388], and HAWKING, PERRY and THURSTON [*ibid.* 1948, v. 45, 685], failed to produce infections by the inoculation of suspensions of liver taken from animals in the incubation period.

The paper is illustrated by two coloured plates containing 10 figures of the pre-erythrocytic schizonts of *P. cynomolgi* and 2 figures of the pre-erythrocytic schizonts of *P. vivax*. These show very clearly the process of development described.

ii. In the account of the Demonstration the main features of the development of *P. cynomolgi* are described and reference is made to other work on mammalian malarial parasites. The largest of these is *Hepatocystes* (*Plasmodium*) *kochi*, which also develops in the parenchyma cells of the liver to schizonts 2 mm. in diameter. It is noted that the earlier stages of this parasite are indistinguishable

from the mature forms of *P. cynomolgi*. The exoerythrocytic schizonts of *P. gallinaceum* in the liver develop in Kupffer cells and when mature measure 10μ. Lastly, in bat malaria, described by MER & GOLDBLUM [*Nature*, 1947, Mar. 29, 444], the unpigmented schizonts seem to develop in the endothelial cells of the blood vessels. They measure about 6μ in diameter. There is thus a range in size between the smallest bat parasite to the considerably larger forms of *P. cynomolgi* and *P. kochi*. [The earlier described schizonts of mammalian malaria reported by MANWELL (this *Bulletin*, 1947, v. 44, 43) from blood films of *Pteropus gouldi* are not mentioned.] *C. M. Wenyon*

OVERMAN, R. R. & FELDMAN, H. A. **The Effect of Fatal *P. knowlesi* Malaria on Simian Circulatory and Body Fluid Compartment Physiology.** *J. Clin. Investigation.* 1947, Nov., v. 26, No. 6, 1049–54, 3 figs. [15 refs.]

Sixteen monkeys (*Macaca mulatta*) were infected by blood inoculation with *P. knowlesi* and the physiological changes in the blood were observed from before infection until death. Measurements were taken of plasma, blood and extracellular fluid volumes (the last by sodium thiocyanate), haematocrit values, plasma proteins, oxygen content and circulation time. The results should be compared with those of KNISELY *et al.* [this *Bulletin*, 1946, v. 43, 1113] as their conclusions are superficially very unlike, chiefly in respect to an increase or decrease, respectively, in plasma volume and the absence or presence of haemoconcentration. Actually, the mechanism changes during the course of the disease. Until 10 per cent. of the blood cells become parasitized, the alterations are slight and the animal looks well but, with increasing infection, the blood changes become marked, and in the 24 hours preceding death, are highly characteristic.

There is a fall in plasma volume, plasma proteins and erythrocytic mass and an increase in " extracellular " fluid.

Not only is there a severe reduction in the numbers of erythrocytes, but these cells carry less oxygen than normal and the circulation time is doubled. Tissue anoxia obviously follows. Death is the result of the latter, associated with failure of circulation and altered cellular permeability (sodium and chlorine ions enter tissue cells, while there is a loss of potassium ions).

P. C. C. Garnham

FREUND, J., THOMSON, K. J., SOMMER, Harriet E., WALTER, Annabel W. & PISANI, Teresa M. **Immunization of Monkeys against Malaria by means of Killed Parasites with Adjuvants.** *Amer. J. Trop. Med.* 1948, Jan., v. 28, No. 1, 1–22, 14 figs. & 1 pl. [10 refs.]

The authors successfully immunized monkeys against *Plasmodium knowlesi*. Rhesus monkeys were employed because in natural infections of this species, 98 per cent. prove fatal. Rarely, a loss of virulence of the parasite takes place and this actually occurred in the present series of experiments, so another strain was obtained from a different source. Incidentally, vaccine prepared from the avirulent strain proved to be ineffective. The vaccine was prepared from heavily parasitized erythrocytes (20 to 95 per cent.) suspended in 0·85 per cent. salt solution containing 0·1 per cent. formalin and concentrated by light centrifugation. This antigen was made into an emulsion with paraffin oil (" Falba " was used as an emulsifier) and dead *Myco. tuberculosis* were added. Two subcutaneous injections of this vaccine were necessary to produce immunity. The composition of the vaccine was varied in many ways, but none of the altered forms gave complete protection, though the substitution of cerotic acid for the tubercle bacilli was partially effective. In the immunized monkey, the challenging dose resulted either in a complete failure to take or, more often,

in a low-grade parasitaemia of short duration. Immunity persisted for at least seven weeks. The injection of vaccine caused a severe local reaction with the production of a nodule which remained for a long time. This lesion contained oil droplets, giant cells, lymphocytes, etc., and it is suggested that it is the presence of these cells which promote immunization. This process is accompanied by the production of complement fixing antibodies.

The authors give reasons for thinking that a *P. knowlesi* vaccine might protect man against a *P. vivax* infection. *P. C. C. Garnham*

DAVIS, B. D. **Complement Fixation with Soluble Antigens of** *Plasmodium knowlesi* **and** *Plasmodium lophurae*. *J. Immunology*. 1948, Mar., v. 58, No. 3, 269–81, 1 fig. [12 refs.]

An improved method of applying the complement fixation test in infections with *P. knowlesi* and *P. lophurae* malaria has been devised. A soluble antigen from *P. knowlesi* was prepared from heavily parasitized monkey blood and the antigen from *P. lophurae* from highly parasitized heparinized blood of infected ducks. Different methods for preparing the antigen are necessary for the two parasites, but the technique of complement fixation is practically the same. The test was positive in high titres—up to 1/320—in animals immunized in three ways: (1) by a formalinized vaccine, (2) by a similar vaccine plus an adjuvant of tubercle bacilli [above] and (3) by vaccination and survival of infection.

The *P. knowlesi* antigen fixed complement in homologous infections only; the *P. lophurae* antigen reacted both against the homologous strain and against *P. knowlesi*. The two antigens exhibit marked differences in nature; the *knowlesi* antigen is a readily soluble material which exists partly outside the parasite, whereas the *lophurae* antigen is confined to intracellular particulates. *P. C. C. Garnham*

TERZIAN, L. A. **A Method for Screening Antimalarial Compounds in the Mosquito Host.** *Science*. 1947, Nov. 7, 449–50.

Many screening tests have been devised for antimalarials in recent years, mammalian or avian hosts being used. In order to avoid the discrepancies noted when results from experimental hosts were applied to human malaria, the present author has investigated the development of *P. gallinaceum* in *Aëdes aegypti* when this mosquito host was maintained on sugar solutions to which a known concentration of various drugs was added. By this means the activity of a drug against a particular parasite can be studied and the method could be applied to the search for prophylactic drugs in human malaria. Quinine, mepacrine (atebrin, quinacrine), plasmoquine (pamaquin), SN 6911 and sodium sulphadiazine were used in these experiments, and the concentrations employed did not deter the mosquitoes from feeding. Administration was begun three days before a meal of infective blood and was continued throughout the experiment. Mortality was correlated with drug levels and the maximum tolerated dose was taken as the concentration which gave rise to a death rate double that in mosquitoes on a diet without drug. Only sulphadiazine affected the production of sporozoites and their viability. At certain concentrations it caused a failure of oöcyst development, sporozoites were rarely produced and when present they were non-infective to chickens. There was a correlation between the results obtained with this drug in sporozoite-induced infections of *P. gallinaceum* in the vertebrate host and those in the mosquito. Sulphadiazine was not active once sporozoites had developed in the mosquito and this development was rarely retarded if drug administration was continued for too

short a period. The method would appear to provide a useful screening test for prophylactic activity in human malaria as well as for investigating the mechanism of drug action. *J. D. Fulton*

TALIAFERRO, W. H. & TALIAFERRO, Lucy G. **Reduction in Immunity in Chicken Malaria following Treatment with Nitrogen Mustard.** *J. Infect. Dis.* 1948, Jan.–Feb., v. 82, No. 1, 5–30, 6 figs. [15 refs.]

The authors have previously shown [this *Bulletin*, 1946, v. 43, 629] that in the case of *P. gallinaceum* and *P. lophurae* infections, exposure to large doses of X-rays may at times reduce immunity, possibly through action on lymphocytes and reduction of the amount of antibody formed. The results then obtained have now been compared with those in the same infections in which tri-(β-chloroethyl)-amine hydrochloride (nitrogen mustard) $N.(CH_2.CH_2.Cl)_3.HCl$ was administered. This substance is known to be toxic to lymphocytes and to cause leucopenia, while other nitrogen mustards affect antibody production. The experimental techniques were similar to those employed earlier. The drug was always freshly prepared and was better tolerated by younger than by older birds. One batch of 26 chickens was treated with nitrogen mustard two days previous to and on the day of inoculation with 10,000 blood forms of *P. gallinaceum*, while 14 other chickens served as controls. Development of parasites was similar in both groups, but at the peak of parasitaemia infection was more intense in the treated birds. This result was not due to a higher reproduction rate as indicated by the number of merozoites per segmenter or to speeding up of the normal 36-hour asexual cycle which was somewhat asynchronous. A similar experiment confirmed that the infection in treated chickens was more intense but not more lethal.

In chickens treated with the drug 68 to 100 hours after infection, the rate of reproduction was curtailed at one period through reduction in the number of merozoites and all stages of the parasite appeared to be affected adversely When nitrogen mustard was administered at different stages of the infection after dosage with quinine on the 5th and 6th day following inoculation, given with the object of allowing immunity to develop, the parasitaemia was much more intense than in the control birds. This result appeared to arise from the reduced number of deaths and not from an increase in the reproduction rate. "Nitrogen mustard chiefly damaged the parasiticidal mechanism of acquired immunity." Large doses of drug injured both host and parasites. In the control infections there was a wide variation in the number of merozoites produced per segmenter according to the stage of infection.

When nitrogen mustard was given before inoculation with *P. lophurae*, the infections were in general more intense than in the controls. The increased intensity of infection in the case of those receiving the largest doses of drug was not due to increased rate of reproduction, and the length of the asexual cycle was unaltered. The greater intensity of infection in birds treated in the prepatent period was likewise not due to increase in the number of merozoites or to a speed-up in the rate of reproduction, but rather to a decrease in the immune reaction of the host. When treatment was given in the patent period the merozoites were reduced in number and the infection was partially suppressed. Differences as well as similarities were apparent in the results obtained on treatment of the two species of parasite. In both cases the drug had a brief parasiticidal effect, best seen when it was given during the acute rise of the infection and more marked in *P. lophurae* than in *P. gallinaceum*. A lowering of the immunity of the host as evidenced by an increase in parasitaemia and decrease in death rate of the parasites was the most pronounced

effect produced by the drug and probably arises from the destructive action of the nitrogen mustard on lymphocytes and indirectly by reducing the production of immune bodies. *J. D. Fulton*

YOELI, M. **Antigens common to *Plasmodium* and *Haemoproteus*.** *Amer. J. Trop. Med.* 1948, May, v. 28, No. 3, 387–93, 2 figs.

"1. Complement fixation tests were carried out in a group of 146 pigeons.

"2. Positive reactions were obtained in all pigeons with a microscopically diagnosed *H. columbae* infection and in the majority of latent chronic infections. The complement fixation test particularly with *P. gallinaceum* antigen was found to be more reliable than direct blood examination for the diagnosis of *H. columbae*.

"3. Antigens prepared from *P. gallinaceum* and *H. columbae* gave specific and group reactions.

"4. The existence of serological cross reactions between the genus *Plasmodium* and the genus *Haemoproteus* was demonstrated.

"5. These results are significant in the light of recent findings of primary tissue forms in Plasmodium.

REDMOND, W. B. **The Electric Charge of Red Blood Cells in Malaria.** *Science*. 1948, Feb. 20, 199–200, 1 fig.

The surface change on red cells of the blood is stated to be affected in various processes such as agglutination, phagocytosis and inflammation and the author suggests that penetration of red cells by malaria parasites also affects their electrokinetic charge. BROWN [this *Bulletin*, 1933, v. 30, 830; 1934, v. 31, 352], using the blood of canaries infected with *P. relictum*, found that the charge was reduced during the patent period, and for some time after the disappearance of parasites. Infected and non-infected cells migrated at the same rate. The factors responsible for the reduction in charge were apparently present in the serum. The present electrophoretic experiments, in which the cells were suspended in buffered glucose at *p*H 7·5, were carried out with normal pigeon blood and during infection of pigeons with *P. relictum*. In general it was found that as the infection progressed the electrophoretic mobility of the red cells was reduced and even more so after the peak of parasitaemia was passed. There followed a slight increase in rate during the sub-patent period. Uninfected cells as a rule migrated more rapidly than those which were parasitized, especially when the number of parasites was decreasing but exceptions were sometimes noted when parasites were small. During infection with *P. relictum*, the charge on pigeon cells therefore appears to be reduced, being smaller on infected than on normal cells. The permeability of the cell may thus be altered and would affect the metabolic processes of the parasite as well as the action of antimalarial drugs. *J. D. Fulton*

HAIBA, M. H. **Plasmodia of Common Egyptian Birds.** *J. Comp. Path. & Therap.* 1948, Apr., v. 58, No. 2, 81–93, 6 pls. & 12 figs.

Blood smears were taken from 22 species of Egyptian birds and were then examined for parasites: 62 birds showed infections, 40 per cent. with plasmodia and 60 per cent. with *Haemoproteus*. The species of *Plasmodium* comprised *P. praecox* (*relictum*), *cathemerium*, *elongatum*, *rouxi*, *nucleophilum* and *gallinaceum*. These are described and a few minor differences from the classical forms are mentioned. *P. relictum* was found commonly in sparrows (up to 80 per cent. being infected); also in pigeons, finches, etc. The incubation period

was 7–8 days. This species differs from *P. cathemerium* not only in the pigment granules but in relative size ; *P. relictum* has schizonts measuring 6·8 to 10·2μ with 8–12 merozoites, *P. cathemerium* has schizonts up to 11·9u in diameter which produce more than 20 merozoites. The incubation period of the latter species was 4–5 days. *P. rouxi* showed one unusual feature, some of the rings had a cytoplasmic tail ending in a dot of chromatin (so-called insect-net form). The alleged presence of *P. gallinaceum* in a dead fowl of European breed is very difficult to understand. This species is not a primary parasite of the domestic fowl, but of the Indian jungle fowl and the present report requires confirmation before acceptance.

The parasites were studied by subinoculation of citrated blood into healthy birds, but no details are given of the actual transmission experiments. Exo-erythrocytic stages were seen in association with infections with *P. relictum*, *cathemerium* and *elongatum* in reticuloendothelial cells of the brain, liver, spleen and lung ; more rarely in the kidney and heart muscle. The presence of *P. elongatum* in such cells and, more remarkable still, in nerve cells in the brain, will need further investigation ; the photomicrograph itself is not convincing.

Haemoproteus gametocytes were observed in sparrows, bee-eaters and finches ; a second type in pigeons and a third in the black duck, *Anas rubripes tristis*. The parasite in the duck is stated to be larger and to stain more deeply than forms in other birds and to possess large yellow-brown pigment granules grouped at the poles of the parasite. The author names it *H. hermani*.

P. C. C. Garnham

TRYPANOSOMIASIS

GEAR, H. S. **African Tse-Tse and Trypanosomiasis Problems. The Brazzaville Conference, 1948.** *South African Med. J.* 1948, May 22, v. 22, No. 10, 342–4.

The author gives a general account of a conference on tsetse and trypanosomiasis which took place at Brazzaville in French Equatorial Africa in February, 1948. It was attended by British, French, Belgian and Portuguese Colonial Delegates and by delegates from Southern Rhodesia and the Union of South Africa. The author remarks that the present is a particularly suitable moment for scientists to take stock of a group of infections of such immense importance in Tropical Africa. It is evident from the text that the author himself was present at the conference : his article gains in value because it is written by a man with a wide public health experience.

Some of the meetings were devoted to chemotherapy and interesting communications were made, including material that has not yet been published. It is evident that both among the arsenical and antimonial compounds there are substances with great curative effect and others which are very promising as prophylactics. Attention was called to the striking differences, in results of therapy, of infections with *T. rhodesiense* and *gambiense* : the view was expressed by FAIRBAIRN that in *rhodesiense* infections treatment is only effective if it is given within four weeks of the infection.

Two territories reported on organized human settlement as a method for the control of tsetse and trypanosomiasis. In Tanganyika there are many thousands of people settled in savannah country which was formerly occupied by *G. morsitans*. It has been found necessary to settle the population on a considerable compact area and at such a density as to allow man to occupy all parts of the area ; when this is done the frontier between cultivation and bush is definite and as short as it can be and this reduces the contact between man

and fly. At Anchau in Nigeria there is an area about 70 by 10 miles in which sleeping sickness was formerly very severe owing to *G. palpalis* and *tachinoides*. Steps were taken to exterminate these flies by a limited degree of waterside clearing and there are now fifty thousand people with many cattle in the area. During the course of the work much has been done to improve standards of village life ; new crops and better farming methods have been introduced together with greatly improved types of housing and layout of villages. It is clear that this use of organized human settlement demands a very good understanding not only of fly and bush but also of local agriculture and the habits of the villager. In skilled hands it is evidently valuable and it leads to permanent general improvement.

The conference also reviewed a number of other methods for controlling various species of tsetse such as discriminative clearing, the use of new insecticides and the control of game.

The conference recommended that a standing scientific committee of experts should be set up to provide for international discussion on the progress of research on tsetse flies and trypanosomiasis. The French and Belgian authorities were invited to set up a bureau to collect and disseminate information.

The author concludes with the hope that these features may ultimately be integrated with other measures for improving the health of tropical Africa as a whole. *P. A. Buxton*

CHORLEY, T. W. *Glossina pallidipes* **Austen attracted by the Scent of Cattle-Dung and Urine (Diptera).** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1948, Mar. 18, v. 23, Pts. 1/3, 9–11.

As the result of much experience in Uganda with several species of *Glossina* the author feels that tsetse flies are guided by their sense of smell more than is generally supposed.

He has observed that *G. morsitans* does not congregate in places through which elephants have passed but it does congregate where they have rested, even a day or two previously. He has made similar observations with *G. pallidipes* and buffalo : he also notices that several species of tsetse flies tend to haunt the places where hippopotomus lie up on shore, which are deep in dung. These observations lead the author to his view that *Glossina* of several species haunt places where there is a strong animal smell.

Chorley has tested this view experimentally, bringing in quantities of cattle dung to places where there were no cattle, and erecting small shelters to protect it from rain ; other shelters without dung were put up as controls. When arrangements were made to catch *G. pallidipes* round the several shelters, it was found that the numbers were consistently greater round those in which dung had been placed than round the others : the difference could be observed even after six weeks when the observer could no longer detect any smell. *P. A. Buxton*

CECCALDI, J., TRINQUIER, E., POCHARD, P. & VARGUES, R. Résultats du traitement de la trypanosomiase humaine par le compose 70 A ou para-arséno. [**The Treatment of Human Trypanosomiasis with 70 A.**] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 11/12, 439–44.

The authors give details of disappointing trials of *p*-arsenosophenylbutyric acid against *T. gambiense* sleeping sickness [for earlier reports and other references, see Report of Brazzaville Pasteur Institute for 1944, this *Bulletin*, 1947, v. 44, 45, and EAGLE, this *Bulletin*, 1946, v. 43, 1017].

Treatment was given intravenously, and daily for periods varying from 7 to 21 days, the individual dose being 0·4 mgm. per kgm. in 63 cases, and 0·3 mgm. per kgm. in the remaining 4 of the total number treated. Trypanosomes usually disappeared from the gland juice or blood within 15 minutes of the first injection, but of patients in the lymphatico-blood stage, only 2 out of 10 treated for 7 days, and only 17 out of 32 treated for 11–20 days, were provisionally cured 6 or 7 months after treatment.

All cases treated in the later stages of infection became worse, with only 1 exception; and combined treatment with "*para-arséno*" and tryparsamide in this type of case gave results inferior to those associated with established forms of treatment. *E. M. Lourie*

SPINKS, A. **The Persistence in the Blood Stream of some Compounds related to Suramin.** *Biochem. J.* 1948, v. 42, No. 1, 109–16, 4 figs. [34 refs.]

It was observed soon after the introduction of Suramin (also known under many other names, Bayer 205, Germanin, Antrypol, Moranyl, etc.) that the drug persisted over long periods in the body as shown by prophylactic action, the trypanocidal effect of the serum of treated animals and by chemical methods. There does not appear to be any particular tissue which acts as a storage depot, since the concentration in plasma is as high as in tissues. The substance has been shown capable of combining with different types of protein *in vitro*. It is possible that it exists as large colloidal particles in solution which prevent easy passage through the kidney glomerulus in the same way as passage is prevented through a collodion membrane. It seems possible that Suramin, being similar in structure to a natural polypeptide, might undergo hydrolysis to its component parts in the body. DEWEY & WORMALL [this *Bulletin*, 1946, v. 43, 830] showed, however, that unlike the parent substance, the products of acid hydrolysis were readily eliminated. Partial hydrolysis may offer an alternative explanation of its persistence in the body. The present author has investigated the persistence in the rabbit of Suramin and eleven other substances either closely related to it or potential products of its hydrolysis, in order to obtain information on the structural features which endow it with its special properties, and also to find out whether they are correlated with activity. The persistence shown by possible hydrolytic products should also serve as a guide to whether they are actually formed in the body. The method of estimation of these substances in plasma depends on diazotization and coupling reactions based on methods previously used by the author [*ibid.* 707]. Recoveries in control experiments averaged approximately ± 10 per cent. For the purposes of estimation, alkaline hydrolysis for a period of 6 hours was invariably used since normal plasma gave smaller blanks by this procedure than if acid hydrolysis was used. In the biological tests, rabbits were injected intravenously with a 2·5 or 10 per cent. solution of the sodium salt of the drug in doses of 100 mgm. per kilo. Plasma concentration-time curves were constructed for all the compounds. The level in plasma of Suramin and closely related compounds was still high after 5 days. The least persistent compounds were completely eliminated within a few hours, while the others showed a persistence intermediate to that of these two groups. Marked persistence was found to be a character of polyamides of high molecular weight having naphthylaminesulphonic acids rather than carboxylic acids as end groups. Therapeutic activity and persistence were not correlated. The possible hydrolytic products were eliminated rapidly and it would appear that Suramin is resistant to hydrolysis and other metabolic processes.

[This is an interesting paper which should be consulted in the original by those interested in order to appreciate the relationships between the various compounds tested.] *J. D. Fulton*

See also p. 757 HEILBRON, **The Rôle of Chemistry in combating Tropical Diseases.**

TAYLOR, Jane & BECKER, E. R. **Liver Changes in Pantothenate-Deficient Rats infected with** *Trypanosoma lewisi*. *J. Infect. Dis.* 1948, Jan.–Feb., v. 82, No. 1, 42–4, 4 figs.

Young rats fed on a standard diet deficient in pantothenic acid are capable of developing unusually heavy infections of *T. lewisi*, with associated pathological changes. These changes are attributed by the authors to the enhanced parasitaemia rather than to the dietary deficiency, since the latter alone produces only moderate effects. The deficiently fed infected rats weigh much less than normal, with proportionately decreased liver weight, but their spleens become heavier in proportion to body weight to a greater extent than in the case of infected animals fed on a normal diet.

Trypanosomes were found not only in the Kupffer but also in the parenchyma cells of the liver. Agglomerated masses of trypanosomes, which normally appear in infected rats from the 10th to 14th day of infection with *T. lewisi*, were not seen in the blood or in organ smears from infected animals fed on the deficient diet. In specimens examined from animals on a normal diet it was noted that these agglomerations were significantly more frequent in liver impression slides than in blood smears. A possible explanation is that the liver sinusoids exercise a screening effect. *E. M. Lourie*

ERCOLI, N. & WILSON, W. **Influence of BAL on the Toxicity and Chemotherapeutic Activity of Mapharsen.** *J. Pharm. & Exper. Therap.* 1948, Feb., v. 92, No. 2, 121–6.

BAL reduces the toxicity of arsenicals and of certain other metallic compounds. The question therefore arises whether it interferes also with their chemotherapeutic activity, and the authors have investigated this question by experiments in which mice infected with *Trypanosoma equiperdum* were treated concurrently by mapharsen and by BAL.

It was found that BAL does, in fact, interfere substantially with chemotherapeutic activity under these experimental conditions. The interference is greater where the criterion of chemotherapeutic effect is sterilization than where it is mere temporary disappearance of trypanosomes from the circulating blood.

Toxicity to the host is influenced by BAL much less than chemotherapeutic effect, thus, the amount of BAL compared with mapharsen necessary to interfere with toxicity was found to be 1·0–2·7 times as much, whilst doses of BAL as low as $\frac{1}{8}$–$\frac{1}{2}$ of the mapharsen weight can interfere with the sterilizing (*i.e.* curative) effect.

The authors conclude that their findings establish the unsuitability of this form of combined chemotherapy. *E. M. Lourie*

CHEN, G. **Effect of Arsenicals and Antimonials on the Activity of Glycolytic Enzymes in Lysed Preparation of** *Trypanosoma equiperdum*. *J. Infect. Dis.* 1948, May–June, v. 82, No. 3, 226–30, 3 figs. [11 refs.]

" Mapharsen, stibamine and tryparsamide were shown to inhibit the activity of hexokinase, adenosine triphosphatase and 3-phosphoglyceraldehyde dehydrogenase systems in lysed *T. equiperdum*.

" The inhibition may be antagonized by cysteine."

LEISHMANIASIS

SHIH LU CHANG. **Studies on Hemoflagellates. IV. Observations concerning some Biochemical Activities in Culture, and Respiration of Three Species of Leishmanias and** *Trypanosoma cruzi*. *J. Infect. Dis.* 1948, Mar.–Apr., v. 82, No. 2, 109–18, 2 graphs. [18 refs.]

It was previously shown by the author that the growth rate of the three leishmania types and of *T. cruzi* is conditioned by the temperature of incubation. Other biochemical characters of these flagellates have now been investigated by techniques previously employed [this *Bulletin*, 1948, v. 45, 590]. A fluid medium with solid base was used to measure oxidation-reduction potentials and *p*H values during growth, at a temperature of 25·5°C. ±1·0, over a period of two weeks. The values for the former (Eh) remained constant over this period but during the first week of incubation there was a fall in *p*H in all cases from 7·4 to around 6·2, followed by a rise during the second week to a value below 7·0. These findings were correlated with the rate of growth of the organisms and the amount of glucose metabolized. In no case did complete breakdown of the sugar to carbon dioxide occur. Succinic, lactic, pyruvic and formic acids as well as CO_2 were detected in all the cultures [no details are given of the tests used or the amounts present]. Death of the organisms after the end of the second week was not prevented by raising the *p*H of the cultures above 7·0 and appeared to be due to the exhaustion of glucose in the medium. In the case of *T. cruzi*, slender crithidial and trypanosome forms did survive for more than two weeks under the above conditions and the *p*H of the medium rose to 8·0 over a period of 6 weeks. Examination after 2 months growth showed that all the intermediate acids were absent except for a trace of pyruvate. It was concluded from this indirect evidence that the acids had been metabolized. The growth rate of the organisms was compared at different oxidation-reduction potentials and led to the conclusion that their metabolic activities differed. It is known that cultures of these organisms do not grow in presence of bacterial contaminants and this suggested to the author that the explanation may lie in the anaerobiosis produced. The view was supported by comparing the growth rate of these flagellates under different conditions of Eh and *p*H brought about by introduction of various organisms to the culture. The results were, however, complicated in some cases by the disappearance of glucose from the medium. With the use of the Warburg manometric technique at 32·5°C. it was shown that glucose and laevulose, but not maltose or lactose, were metabolized by all four parasites. The rate of O_2 uptake was correlated with the growth rate of these organisms.

J. D. Fulton

ADLER, S., TCHERNOMORETZ, I. & BER, M. **The Action** *in vitro* **of some Aromatic Diamidines on a Sudan Strain of** *Leishmania infantum*. *Ann. Trop. Med. & Parasit.* 1948, Apr., v. 42, No. 1, 1–4. [12 refs.]

The leishmania of Sudanese kala azar is generally named *L. donovani*, but since this infection resembles the Mediterranean form in being less responsive to antimonials and to aromatic diamidines than is Indian kala azar, ADLER and his colleagues consider that the Sudan leishmania should be referred to as *L. infantum*.

The authors have now studied the action of aromatic diamidines on a Sudan strain of *L. infantum* by the same technique as they previously used for a similar study of *L. donovani* [this *Bulletin*, 1946, v. 43, 114]. Parallel experiments were carried out with L. D. bodies, suspensions of which were obtained by a

method already described by ADLER and ASHBEL [this *Bulletin*, 1941, v. 38, 255]. They found that propamidine and pentamidine have significantly less action on the flagellates of *L. infantum* than on those of *L. donovani*. Stilbamidine, however, is equally effective against flagellates of both strains, although Indian kala azar responds more readily than Sudan kala azar to treatment with this compound. As in their previous experience with *L. donovani*, stilbamidine was found to be less active *in vitro* against the flagellates of *L. infantum* than either propamidine or pentamidine. [COLLIER and LOURIE (this *Bulletin*, 1946, v. 43, 1126) however, using a different technique, found stilbamidine to exercise much the same high degree of activity as propamidine and pentamidine against flagellates of *L. donovani*, and it would therefore be interesting to know whether their apparently more sensitive measure of stilbamidine-activity would reveal differences in response to this compound between flagellates of *L. infantum* and *L. donovani*.]

L. D. bodies were found to be more sensitive than flagellates to the action of each of the three diamidines tested. *E. M. Lourie*

HENRY, A. J. **The Instability of Stilbamidine.** *Brit. J. Pharmacol. & Chemotherapy.* 1948, June, v. 3, No. 2, 163–6. [13 refs.]

The author [this *Bulletin*, 1944, v. 41, 196] suggested a number of changes which probably occurred in solutions of stilbamidine including *cis-trans* isomerism, hydrolysis of one or both amidine groups to the corresponding amides, and dimerization with formation of a cyclobutane derivative. Details of some experimental data in support of these views have since been reported (*J. chem. Soc.*, 1945, Dec., 870 ; 1946, Dec., 1156). In the present paper, the formation of the amides, which appears to depend on *p*H and temperature, are described. The monoamide is more toxic than stilbamidine itself and the author believes that its formation in the body may account for the delayed toxic effects observed after administration of the parent drug, since he has noted that stilbamidine or a closely related substance continues to be excreted in the urine of patients with kala azar for some eighteen months after the end of treatment. The dimerization product was likewise found, by experiments on sheep, to be retained for long periods in the body. The crystallographic data recorded for it by FULTON & DUNITZ [this *Bulletin*, 1947, v. 44, 988] are in agreement with the formation of *trans*-stilbamidine observed by the author on irradiation.

J. D. Fulton

BOSSELUT, H. Un cas de leishmaniose générale du chat. [**Generalized Leishmaniasis in a Cat.**] *Arch. Inst. Pasteur d'Algérie.* 1948, Mar., v. 26, No. 1, 14.

This note records the presence of leishmaniae in ulcers from the ear of a Siamese cat in Algiers. The cat also had adenitis and an ulcer on the lip. The cat died shortly after it had been first examined: no autopsy was available. This is believed to be only the third recorded case of leishmaniasis in the cat. The first case, also in Algiers, was recorded by SERGENT *et al.* over 35 years ago (*Bull. Soc. Path. Exot.* 1912, v. 5, 93).

H. J. O'D. Burke-Gaffney

FULTON, J. D. & JOYNER, L. P. **Infections by *Leishmania donovani* in the Cotton Rat.** *J. General Microbiol.* 1948, Jan., v. 2, No. 1, 103–9, 1 fig. [12 refs.]

The cotton rat was shown to be susceptible to infection with *Leishmania donovani* (an Indian strain maintained in hamsters since 1939). Infection was

produced by intraperitoneal inoculation of a suspension of infected spleen, and the disease (which is symptomless in the cotton rat) progressed regularly with no tendency to spontaneous cure. The animals did not die, however, and in this way differed from hamsters, which invariably succumb to leishmaniasis. The spleen became enormously enlarged and contained numerous parasites; the liver equally so, during the early stages. The infection did not pass to the offspring of diseased mothers. Orkney voles were insusceptible.

P. C. C. Garnham

MUNIZ, J. & MEDINA, H. Leishmaniose tegumentar do cobaio. *Leishmania enriettii* n. sp. [**Cutaneous Leishmaniasis in the Guineapig.**] *Hospital.* Rio de Janeiro. 1948, Jan., v. 33, No. 1, 7–25, 10 figs. English summary.

Since at present, the species of Leishmania, *L. enriettii*. with which this article is concerned appears to be almost restricted to the guineapig, the subject is one of comparative pathology mainly and does not call for a very detailed account. The reasons for mentioning it here are, that it is a species easily cultivated, that guineapigs are readily infected, experimentally as well as spontaneously and that it may be used for testing therapeutic substances. Subcutaneous inoculation of material from lesions or from cultures invariably sets up the disease in guineapigs, but very rarely does so in other animals. Rhesus monkeys, hamsters, dogs, white rats and mice were heavily inoculated but only one hamster (*Cricetus auratus*) and one puppy showed any leishmanial lesions and they were small and seemed to be retrogressing. The preá (*Cavia aperea*), known also as the Brazilian opossum and closely allied to the guineapig, could not be thus infected. Reciprocally, the guineapig is resistant to infection with *L. tropica* and *L. donovani*. The morphological characters of *L. enriettii* are described in detail. *H. Harold Scott*

TORRES, C. M., MUNIZ J., CARDOSO, Rita A. de A. & DUARTE, Eitel. Caracteres do granuloma histiocitário na leishmaniose espontânea da cobaia. [**The Histological Characters of Leishmanial Granuloma of the Guineapig.**] *Hospital.* Rio de Janeiro. 1948, Mar., v. 33, No. 3, 405–8, 3 figs. English summary.

One of the most characteristic features of infection of guineapigs by *L. enriettii* is the production of a granuloma consisting largely of histiocytes and macrophages enclosing many of the parasites in their cytoplasm. Equally characteristic are the readiness and rapidity with which these cells become transformed into fibroblasts and may then be diagnosed as fibromata or, even more commonly, as spindle-celled sarcomata—pseudo-neoplasm, as the authors designate it [though why " pseudo " is not clear, unless the term neoplasm is restricted to malignant growths]. Three photomicrographs show the condition well and from the third it can easily be understood how confusion might arise and a diagnosis of fibro-sarcoma be made. *H. Harold Scott*

FEVERS OF THE TYPHUS GROUP

HIRVONEN, M. **Clinical and Serologic Observations during a Typhus Fever Epidemic.** *Ann. Med. Intern. Fenniae.* 1948, v. 37, No. 1, 51–60. [14 refs.]

In one section of a hospital for prisoners of war, 32 cases of typhus fever occurred within a period of six weeks. In five of the cases the Weil-Felix reaction remained negative throughout the illness, and in all but one of the

remaining cases the reaction became negative within nine weeks of the end of the illness. A positive reaction with the Widal test occurred in 12 cases. The fatality rate was 44 per cent. *John W. D. Megaw*

WANG, P. J., FU, H. H. & LIU, W. T. **A Note on Typhus Fever in Lanchow.** *Chinese Med. J.* 1948, Feb., v. 66, No. 2, 79–83.

During the three years 1943–1945 the authors studied 131 cases of typhus fever at Lanchow in North-West China. The epidemiological conditions pointed to louse-borne infection.

Three strains of rickettsiae were isolated; these caused frequent Neill-Mooser reactions during ten consecutive passages through guineapigs but examination of the strains by the U.S.A. Typhus Commission workers at Cairo showed that they gave complement-fixation and immunity reactions indicating epidemic-typhus infection.

Local house rats and their fleas were examined, but no evidence of infection could be detected. *John W. D. Megaw*

DE MAGALHÃES, O., ROCHA, A. & RODRIGUES, I. Contribuição para o conhecimento do tifo exantemático neotrópico no Brasil. Nota prévia. [**A Preliminary Note on Epidemic Typhus in Brazil.**] *Brasil-Medico.* 1948, Apr. 3 & 10, v. 62, Nos. 14/15, 154–5.

DE MAGALHÃES, O. & ROCHA, A. Contribuição para o conhecimento do tifo exantemático neotrópico no Brasil. (Possibilidade da transmissão pelo leite.) Nota prévia. [**A Preliminary Note on the Possibility of the Transmission of Epidemic Typhus by Milk in Brazil.**] *Brasil-Medico.* 1948, Apr. 3 & 10, v. 62, Nos. 14/15, 153–4, 1 fig.

GIROUD, P. & JEZIERSKI, A. Comportement sur poumon de lapin du mélange du virus aphteux O et des rickettsies du typhus épidémique. [**The Effect of Lung Inoculation of the Rabbit with a Mixture of the Virus O of Foot-and-Mouth Disease and Epidemic-Typhus Rickettsiae.**] *C.R. Soc. Biol.* 1947, Dec., v. 141, Nos. 23/24, 1181–2.

In the course of their studies of the virus of foot-and-mouth disease the authors carried out experiments on the effect of lung inoculation of rabbits with a mixture of the virus and epidemic-typhus rickettsiae.

By the end of five successive passages the rickettsiae had died out, whereas the virus continued to be transmitted. *John W. D. Megaw*

FRANKE, R. Die Weil-Felixsche Reaktion nach Fleckfieberschutzimpfung. [**The Weil-Felix Reaction after Anti-Typhus Inoculation.**] *Klin. Woch.* 1947, Sept. 15, v. 24/25, Nos. 47/48, 746–9, 1 fig.

Weil-Felix tests were carried out on a group of 60 persons before, and after, inoculation with three doses of yolk-sac, mouse-lung, or rabbit-lung vaccine. Four to five days after the third dose, a titre of 1–100 was observed in 50 per cent. of the cases; in 10 per cent. the titre rose to 1–400, and in two cases it was 1–800. In 10 per cent. no rise of titre could be detected. In a few cases the test was repeated three weeks after the last dose of vaccine, and in nearly all of these the titre had fallen to an appreciable degree.

John W. D. Megaw

BERGE T. O. **Employment of Soluble Antigen in Screening Tests for Typhus Complement Fixation.** *Pub. Health Rep.* Wash. 1948, Apr. 23, v. 63, No. 17, 529–37. [13 refs.]

Soluble antigens liberated from suspensions of *Rickettsia prowazeki* and *R. mooseri* by ether extraction are known to be incapable of differentiating between epidemic and murine types of infection, but they have great practical advantages over the more specific purified antigens in being easily and cheaply prepared.

The author describes the technique by which he has prepared the soluble antigens from several strains of epidemic and murine rickettsiae; he has employed the strains in complement-fixation tests of antisera obtained from guineapigs infected with different strains of rickettsiae. The same antisera were also tested with specific purified antigens prepared from the strains of rickettsiae used in the above tests. It was found that soluble antigens prepared from any of the strains of epidemic and murine rickettsiae gave positive reactions with every strain of antiserum, and that the reactions were usually at higher titres than those obtained with specific antigens, even when the latter were prepared from homologous strains of rickettsiae.

Further tests were carried out on 475 sera of presumably healthy persons from Korea and Japan; 47 of the sera were anticomplementary, 169 reacted at titres of 1–10 to 1–80, and of these 72 were positive also with epidemic or murine specific antigens or with both. In no case did a serum react with a specific antigen when it had not already reacted with soluble antigens of every strain used in the tests, and in only six cases was the reaction with the soluble antigen at a lower titre than that with the specific antigen.

It was concluded that in diagnostic and survey work a preliminary set of screening tests with soluble antigen, either epidemic or murine, would greatly diminish the number of tests that would have to be carried out by the troublesome and costly employment of the purified specific antigens.

John W. D. Megaw

RENNER, K. Über die Behandlung des Fleckfiebers. [**The Treatment of Typhus Fever.**] *Klin. Woch.* 1947, Nov. 1, v. 24/25, Nos. 53/54, 848–50.

Since 1941 the author has had experience in the treatment of more than 1,000 typhus patients in a large war hospital in the "East".

An analysis is given of the results observed in 900 acute cases seen between October, 1941 and March, 1944. Dividing the 900 cases into six equal groups in chronological sequence it was found that the fatality rate showed a remarkable decline. In the first group treated in the winter of 1941–42 the death rate was 36·3, in the next two groups it was 16·7 per cent. and in the last two it had fallen to 6·0 per cent.

The author admits that this striking improvement certainly cannot be attributed solely to better methods of treatment, but he claims that his latest system deserves wide publicity because of the remarkably good results that were obtained.

Drugs claimed to be specific, including atebrin, plasmoquine, eubasin, cibazol and pyramidon, are regarded as useless, sometimes dangerous. Convalescent serum, when given after the third day, was without value.

The secret of success is claimed to consist in the administration of cardiovascular tonics and sedative drugs when, and only when, there are indications that these are needed. Threatened vaso-motor collapse is treated by such drugs as camphor, caffeine, strychnine, adrenaline and strophanthin, and by intravenous salines. For severe headache, insomnia and restlessness, morphia, luminal and veronal are recommended.

In the winter of 1944, a number of patients who came under treatment on the second or third day were at once given 500 cc. of convalescent blood and the results observed are said to have been startling, but little information is given with regard to the number of cases treated or the evidence on which so early a diagnosis was made. The author simply states that the symptoms and circumstances of cases left no room for doubt as to the nature of the illness.

John W. D. Megaw

Ehrlich, J., Bartz, Q. R., Smith, R. M. & Joslyn, D. A. **Chloromycetin, a New Antibiotic from a Soil Actinomycete.** *Science.* 1947, Oct. 31, 417.

A *Streptomyces* sp. was isolated from a soil sample in a field near Caracas, Venezuela. Agar streak cultures were found to inhibit inocula of numerous common Gram-positive and Gram-negative organisms. Filtrates of submerged aerated cultures of the *Streptomyces* showed marked antibacterial activity against several Gram-negative bacteria, especially *Sh. sonnei*. A crystalline antibiotic has been isolated from the filtrates and the name Chloromycetin is proposed for it. Details of preparation are described. The *in vitro* activity of the crystalline product against several bacteria is shown in a table. The intravenous LD_{50} for 20 gm. mice is 3·0 mgm./mouse. Chloromycetin, unlike streptomycin, appears to be well absorbed when given orally to mice and dogs.

The immediate interest of this new antibiotic to readers of this *Bulletin* lies in its indications of antirickettsial activity [see below].

H. J. O'D. Burke-Gaffney

Smadel, J. E. & Jackson, E. B. **Chloromycetin, an Antibiotic with Chemotherapeutic Activity in Experimental Rickettsial and Viral Infections.** *Science.* 1947, Oct. 31, 418, 1 fig.

The authors describe tests on chick embryos and mice infected with *R. orientalis* and have found the drug highly effective. Mice treated with suitable doses either by the intraperitoneal or oral route were completely protected against lethal doses of infection. For example, daily doses of 2·5 cc. of the drug given by the intraperitoneal route saved all the eight mice whose treatment was started five days after infection. Daily doses of 5·0 mgm. given by the mouth saved seven out of eight mice whose treatment was started two days after infection.

Similar results were obtained with chick embryos infected with *Rickettsia akari* (of rickettsialpox), *R. prowazeki*, *R. mooseri*, *Dermacentroxenus rickettsi*, and two strains of psittacosis virus. Mice infected with *R. akari* were treated with similar success.

John W. D. Megaw

Payne, E. H., Knaudt, J. A. & Palacios, S. **Treatment of Epidemic Typhus with Chloromycetin.** *J. Trop. Med. & Hyg.* 1948, Apr., v. 51, No. 4, 68–71, 2 figs. & 2 maps.

Chloromycetin had already been found effective in preventing the death of embryo chicks infected with various rickettsiae, including *Rickettsia orientalis*, *R. prowazeki*, *R. mooseri*, and *R. rickettsi* [see above].

The authors describe clinical trials of the drug during an epidemic of typhus fever in Bolivia in December, 1947. It is stated that 16 cases of typhus and "five normal controls" were treated, and that six of the cases were adequately studied and followed up.

The report consists of a description of one fatal "control case," and of six of the treated cases in which all of the patients are said to have shown rapid improvement, resulting in convalescence within three days.

The drug was given orally to four of the patients in doses of 0·5 to 1·0 gm. twice daily for three days, and intravenously to the other two patients, aged 12 and 14 years respectively, in doses of 0·2 and 0·25 gm. twice daily for three days. No toxic reactions were observed.

[Although the results as described do not lend themselves to a definite evaluation of the effects of the drug they justify further trials which, if possible, ought to be carried out in conditions permitting comparison with alternate controls, either untreated or treated with para-aminobenzoic acid.]

John W. D. Megaw

RICKARD, E. R. & RILEY, E. G. **A State-Wide Survey of Typhus Fever in Florida.** *Amer. J. Pub. Health.* 1948, Apr., v. 38, No. 4, 541–9, 3 charts & 1 map.

The name typhus fever is employed in the title of this paper as a designation for murine typhus. A description is given of a detailed survey of the incidence of the disease in the State of Florida during the three years, 1944–1946.

About 69 per cent. of the population (2,250 000) lived in urban conditions in towns of 1,000 inhabitants and over. The officially reported numbers of cases for the three years were ; 496, 380 and 420, respectively, but the real numbers were estimated as being at least 1,234, 1,045 and 793. Personal investigations were made in about two-thirds of the cases.

The distribution was comparatively uniform throughout the State ; the rural population was nearly as heavily affected as the urban. The incidence was considerably higher among the white than the coloured population and among adults than young children, but the authors believe that many cases occurring in coloured persons and children are likely to have been missed.

During the period, 1,337 cases with positive or doubtful Weil-Felix reports from State and private laboratories were investigated : 1,038 of these had given reactions at titres of 1,320 or over, and in 95 per cent. of this group the diagnosis was considered to be justified on clinical grounds : among the 299 cases with reactions at a titre of 1–160 the diagnosis was confirmed in 73 per cent.

In 67 per cent. of the cases, infection was believed to have been acquired in the homes ; in 28 per cent. places of business were considered responsible, and about two-thirds of these were concerned with food handling ; in the remaining cases no opinion could be formed with regard to the place of infection.

There was a sharp decline in the incidence during the period in the two regions in which control measures were being carried out.

John W. D. Megaw

IRONS, J. V. MURPHY, J. N. Jr. & DAVIS, D. E. **The Distribution of Endemic Typhus in Rats in Lavaca County, Texas.** *Pub. Health Rep.* Wash. 1948, May 21, v. 63, No. 21, 692–4.

" Based on results of complement-fixation tests for endemic typhus of rats in Lavaca County, Texas :

" 1. Ninety-four percent. of 70 urban establishments sampled harbored rats with positive tests. Of 472 *Rattus rattus* from urban establishments, 61 percent. gave positive tests and of 36 *Rattus norvegicus*, 69 percent. gave positive tests.

" 2. In rural or semirural areas 77 percent. of 203 farms or semi-rural establishments harbored rats with positive tests, and 44 percent. of 528 rats gave positive tests.

" 3. The widespread distribution of typhus in rats on farms suggests that such areas must be included in control activities."

FITZPATRICK, Florence K. **Susceptibility to Typhus of Rats on Deficient Diets.** *Amer. J. Pub. Health.* 1948, May, v. 38, No. 5, Pt. 1, 676–81.

Groups of 12 or more rats were kept for six weeks on various diets planned so as to imitate deficiency diets such as exist or might occur in different parts of the world. Then two-thirds of the rats in each group were inoculated intraperitoneally with varying doses of murine-typhus rickettsiae. In some of the experiments the infecting doses were lethal to 50 per cent. of normal rats; in others the doses were sublethal.

The susceptibility of the rats was found to be increased by diets deficient only in one of the following respects (1) low proteins, (2) one-tenth of the optimum supply of vitamins of the B group, (3) reduced pantothenic acid, (4) reduced riboflavin, and(5) reduced thiamin.

Rats kept on diets deficient only in containing one-fortieth of the optimum amount of one of the following substances: pyridoxine, choline, nicotinic acid, and para-aminobenzoic acid were not affected. With a similar reduction in the amount of thiamin, pantothenic acid or riboflavin, premature deaths occurred among the rats.

The addition of one per cent. liver powder to the complete diet did not increase the resistance of the rats to infection.

An interesting point was that rats kept on a natural laboratory diet were decidedly less susceptible to infection than those kept on a complete synthetic diet, even though the latter caused a greater increase in weight.

Full details of the diets employed and of the results of the experiments are given in the paper. *John W. D. Megaw*

DUNN, T. B. **A Case of Murine Typhus in London.** *Brit. Med. J.* 1948, May 22, 979–80.

A Jewish patient aged 61 years, who had emigrated from Western Russia 36 years ago, was attacked by typhus fever in June, 1947.

A fortnight before the onset he had been engaged at the London Docks in testing eggs belonging to a cargo that had arrived from Poland. He said that he had frequently been bitten by fleas while at work. A search was made for rats in the area but none could be found. There was no evidence of louse infestation.

The Weil-Felix (OX19) titre was 1–125 on the 11th day and 1–500 on the 14th day. With the rickettsia-agglutination test, a titre of 1–2,560 was observed with murine rickettsiae and one of 1–640 with epidemic rickettsiae.

Infestation of the egg packing cases with infected fleas was suspected of being the source of infection. In spite of the patient's having lived in Russia till the age of 25, the diagnosis of Brill's disease is regarded as very unlikely. A further report on the serological findings is promised. *John W. D. Megaw*

SAVOOR, S. R. & DAS MENON, P., in collaboration with S. M. MERCHANT. **Scrub Typhus (Tsutsugamushi Disease) in Bombay.** *Indian Med. Gaz.* 1948, Dec., v. 82, No. 12, 752–6, 1 fig. on pl. [13 refs.]

Four cases of scrub typhus are described as occurring in persons who had not gone outside the municipal limits of Bombay City during the four weeks preceding the onset of the attacks. In two cases there was an eschar, and in one case *Rickettsia orientalis* was isolated from a patient's blood by mouse inoculation and by intraocular inoculation of rabbits.

The authors think that three of the patients had probably been infected through contact with mite-infected coarse vegetation; in the fourth case the only possible source of infection seemed to be the handling of vegetables.

All the cases occurred during and after the rains (June to December, 1945), and in a footnote SOMAN states that he has detected 17 cases of scrub typhus in Bombay during the months September, October, and November, 1946. *R. orientalis* was isolated from seven of the patients. No cases occurred during the other months of the year, although the system of detection was the same throughout the period. *John W. D. Megaw*

FINDLAY, G. M. & ARCHER, G. T. L. **The Occurrence of Tick-borne Typhus in West Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 815–18, 1 chart.

Three cases of typhus fever, diagnosed on serological evidence as tick-borne, occurred during the last three months of 1943. The patients were Europeans living in military camps; two of them were stationed in North Ashanti and appear to have been the persons referred to in a paper by FINDLAY and ELMES [see this *Bulletin*, 1948, v. 45, 322]; the third patient was living on the Jos Plateau in North Nigeria.

The chief evidence pointing to tick-borne infection is stated as being the absence of complement-fixing antibodies and agglutinins for murine and epidemic typhus and the presence of antibodies for South-African tick typhus. In one case rickettsiae were isolated from the patient's blood and passaged twice through guineapigs, in which some inflammation of the tunica vaginalis occurred. This patient's blood gave a Weil-Felix reaction with "the slide test" against *Proteus OX2*, but not against *P. OX19* or *P. OXK*; the complement-fixation titre against epidemic and murine antigens was 1–50, against South-African tick typhus it was 1–400.

In the other two cases the epidemic and murine titres were 1–50 and 1–12·5 respectively, the tick-typhus titre was 1–200 in each case.

John W. D. Megaw

NILES, J. O. & BOURNE, G. C. **The Use of Para-Aminobenzoic Acid in a Case of Rocky Mountain Spotted Fever.** *New England J. of Med.* 1948, May 27, v. 238, No. 22, 769.

"A case of Rocky Mountain spotted fever treated successfully with para-aminobenzoic acid is presented. No toxic effects to the drug were noted."

WEGMANN, T. Ueber eine Q-Fever (Queenslandfieber)—Epidemie in Graubünden. [**An Epidemic of Q Fever in Graubünden (Grisons, Switzerland).**] *Schweiz. med. Woch.* 1948, June 5, v. 78, No. 22, 529–31, 4 figs.

In April 1947, 19 cases of Q fever occurred among 75 persons who had been engaged in unpacking and erecting a large printing press which had arrived from Cincinnati, Ohio, packed in straw in several wooden packing cases. The work of unpacking and erecting took four days, and it was obviously during this period that infection occurred. The average incubation period was estimated as about 16 days, the extreme range was 9 to 23 days.

The nature of the disease was not recognized till nine months after the occurrence of the outbreak, when complement-fixation tests against an American strain of *Rickettsia burneti* gave positive responses in the 16 patients whose sera were obtainable. The titres ranged from 1–10 to 1–320. The diagnosis in most of the cases had been influenza or fever of uncertain origin.

Infection was believed to have been due to the inhalation of infected dust from the straw contained in the packing cases. *John W. D. Megaw*

STRAUSS, E. & SULKIN, S. E. **Studies on Q Fever: Complement-Fixing Antibodies in Meat Packers at Fort Worth, Texas.** *Proc. Soc. Exper. Biol. & Med.* 1948, Feb., v. 67, No. 2, 139–41. [Refs. in footnotes.]

Sera from 1,443 persons engaged in handling meat at plants in Fort Worth, Texas, were tested by Bengtson's method for complement-fixing antibodies of *Rickettsia burneti*. Positive reactions at titres of 1–8 or over were obtained in 114 cases (8 per cent.), including 17 cases (1·2 per cent.) in which the titre was 1–64 or over.

These results were regarded as showing that some unrecognized attacks of Q fever had occurred among the persons examined.

Further studies are in progress to find whether the antibodies occur among persons belonging to other occupational groups in the area.

John W. D. Megaw

SULKIN, S. E. & STRAUSS, E. **Studies on Q Fever: Persistence of Complement-Fixing Antibodies after naturally acquired Infection.** *Proc. Soc. Exper. Biol. & Med.* 1948, Feb., v. 67, No. 2, 142–4.

Sera from 17 persons known to have had naturally acquired attacks of Q fever in March, 1946, at Amarillo, Texas, were tested at later dates for complement-fixing antibodies of Q fever.

All the sera gave positive reactions five to seven weeks after the attacks; in the 11 cases in which the titre was estimated it ranged from 1–64 to 1–1,024.

Among 13 sera tested six months after the attack, 10 gave titres of 1–32 or over; the other three gave titres of 1–16; 1–8; and less than 1–8, respectively.

Seven sera were tested 17 months after the attack; all were positive at titres of 1–16 or over, including one at 1–128 and one at 1–1,024.

It was thought possible that the person who reacted at 1–1,024 may have had "continued contact with the rickettsial agent subsequent to the initial illness."

John W. D. Megaw

ASCHENBRENNER, R. Pathogenetische und therapeutische Probleme beim Wolhynischen Fieber. [**Pathological and Therapeutic Problems of Trench Fever.**] *Klin. Woch.* 1947, May 15, v. 24/25, Nos. 31/32, 481–8, 7 figs. [57 refs.]

The paper contains a critical review of the literature dealing with trench fever as observed during the two World Wars, and a brief description of a few cases seen by the author in 1942 and 1943.

Most of the papers discussed have already been reviewed in this *Bulletin*. The author is very sceptical regarding the value of the numerous special lines of treatment that have been recommended by German physicians. He specially condemns the light-hearted use of injections of bacterial toxins and mentions a case of sudden death after an injection of "Pyrifer" given intravenously. He also states that another patient died suddenly after an intramuscular injection of prontosil. He states that an independent trial has failed to substantiate the claims made by HESSE and KREMSER for X-ray therapy in chronic cases, but in a later issue of the same journal [see below] Hesse asserts that the author when challenged was unable to produce satisfactory evidence with regard to the nature of the trial.

The paper conveys the impression that surprisingly few additions have been made during the recent war to knowledge of trench fever.

John W. D. Megaw

HESSE, E. Pathogenetische und therapeutische Probleme beim Wolhynischen Fieber. [**Pathological and Therapeutic Problems of Trench Fever.**] *Klin. Woch.* 1947, Nov. 15, v. 24/25, Nos. 55/56, 889.
See above.

DENGUE AND ALLIED FEVERS

PERRY, W. J. **The Dengue Vector on New Caledonia, the New Hebrides, and the Solomon Islands.** *Amer. J. Trop. Med.* 1948, Mar., v. 28, No. 2, 253–9. [10 refs.]

It has been known for some years that dengue occurs in those parts of Melanesia to which the paper refers. In this area, *Aëdes aegypti* occurs as a relatively recent introduction limited to areas round ports and places where Europeans live. In such places dengue occurred and the author concluded that it was carried by *Aëdes aegypti*. He also gave attention to the possibility that it might be carried in completely rural areas by members of the *Aëdes scutellaris* group: of these, *Aëdes hebrideus* is widely distributed in the area, breeding in small rot holes, etc., in the forest and biting man freely. The author could find no evidence of the occurrence of dengue in such areas. As he observes, his experience is different from that of MACKERRAS in New Guinea [see this *Bulletin*, 1947, v. 44, 518]. In that island, sporadic outbreaks of dengue occurred in rural areas, in the absence of *Aëdes aegypti*: the virus was passed through the bite of *Aëdes hebrideus* to healthy volunteers.

P. A. Buxton

PLAGUE

MALTA. REP. ON HEALTH CONDITIONS OF THE MALTESE ISLANDS AND WORK OF MED. & HEALTH DEPT. FOR YEAR 1945 [CAUCHI, J., Chief Govt. Med. Officer]. Appendix HA. pp. 1571–92. **Report on the Outbreak of Plague 1945–46.**

Early in 1945, plague had already appeared in the ports of Algiers, Oran, Haifa, Jaffa, Ferryville and the Suez Canal Area, spreading later to Ajaccio, Taranto, Palermo and Rhodes. In Malta it broke out at the same time as in Ajaccio. Altogether 80 cases of bubonic plague made up the epidemic; none was pneumonic and only one septicaemic. The epizootic that occurred in rats was widespread and human cases were soon recorded from different localities with the result that bubonic plague was notified as existent from June 1945. The course of the epidemic is followed in this report month by month up to June 1946, with a total of 22 deaths and case mortality rate of 27·5 per cent. Both epidemic and epizootic seem to have subsided, for no infected rats have been detected since February 1947. The rat poisons used in combating plague were zinc phosphide and arsenic. *W. F. Harvey*

HADDAD, C. & VALERO, A. **Streptomycin in Bubonic Plague.** *Brit. Med. J.* 1948, May 29, 1026–7.

Three severe cases of treated bubonic plague and one control untreated are not a large number. They are published as being sufficiently dramatic to suggest that streptomycin is superior to any drug that has preceded it in

regular use. In the three cases treated with streptomycin (200 or 300 mgm. every 3 hours) both sulphonamides and penicillin had been without effect. The administration of streptomycin, however, gave rapid improvement and final recovery. The fourth patient, who was not treated with streptomycin, died. *W. F. Harvey*

CHOLERA

Abdou, S. **Susceptibility to Cholera.** *Lancet.* 1948, June 12, 903–4. [18 refs.]

The epidemiology of cholera as regards its vibrio, its incidence and its spread, presents many problems for debate. Susceptibility and severity are two outstanding problems and these are the subjects treated by the author. Cholera " does not strike all classes . . . with the same severity." One Egyptian village of 1,600 inhabitants presented a good example. Many of the inhabitants suffered from multiple infections : schistosomiasis, ankylostomiasis, amoebiasis, ascariasis and malaria. One family group of 150 persons contrasted markedly with the rest, for it was free from parasitic infections and all of them "in spite of their varied economic status " escaped the infection. There were 52 cases of cholera in the village with 25 deaths. The deaths were distributed—so far as examination proved it—among those suffering from intestinal schistosomiasis or some other parasitization with or without pellagra. Eleven deaths out of 21 were in children and these had not been examined for parasites. " Anyone over the age of one year who had diarrhoea and vomiting and died within two days " was considered to have had cholera. The author pays attention to the pathways of human infection, the oropharyngeal and the gastro-intestinal, and discusses the bearing of gastric acidity on susceptibility ; achlorhydria and hypochlorhydria would remove the barrier to passage of vibrios into the intestine. Another puzzling circumstance in this village outbreak was, for a disease with the case-to-case reputation of cholera, that seldom more than one member of any household was attacked with cholera. " If the vibrio crosses the stomach barrier, its further fate depends on many factors, of which the intestinal pH is perhaps the one that determines the development of disease or of the carrier state, or the destruction of the vibrio." Vaccination was started five days after notification of cholera, but the author concludes that "a high standard of sanitation seemed to be a better safeguard than immunization." *W. F. Harvey*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Calvo Fonseca, R. La incidencia de la *E. histolytica* en Cuba. Plan para lograr la uniformidad de los métodos de investigación y técnicas de examen coprológico a usar en las encuestas sobre *E. histolytica* en los países Americanos. [**Incidence of *E. histolytica* Infection in Cuba. Plan to secure Uniformity of Method in American Countries.**] *Bol. Oficina Sanitaria Panamericana.* 1947, Nov.–Dec., v. 26, Nos. 11/12, 943–53. English summary.

Records of the incidence of *E. histolytica* infection in Cuba have been very contradictory and misleading. They have been made in a few, isolated districts and returns have ranged between 1·2 and over 30 per cent. Moreover, some observers have classed *histolytica* infections under the general term amoebiasis, not distinguishing this species from *E. coli* and *Endolimax nana.*

If a large number of persons from many parts of the island are examined—what might be called a fair cross-section of the people—the incidence would not be regarded as high. Thus, of 38,091 specimens of persons from 6 Provinces and over 120 Municipalities an average of only 2·2 per cent. was positive. Yet further, the techniques employed differ; some examine only a few persons in a group, others, perhaps, examined only a single faecal specimen, and rarely more than two. The author suggests the setting up of an international [or inter-American] commission to determine the methods to be adopted for diagnosis, the number of specimens to be examined, the number of persons, the social groups, urban and rural, and the statistical procedure, in order that comparable records may be made. [See also this *Bulletin*, 1948, v. 45, 257.]

H. Harold Scott

Meleney, H. E. & Zuckerman, Lucille K. **Note on a Strain of Small Race *Endamoeba histolytica* which became Large in Culture.** *Amer. J. Hyg.* 1948, Mar., v. 47, No. 2, 187–8.

In 1938, the senior author with Frye [this *Bulletin*, 1939, v. 36, 293] reported on a strain of small race *Entamoeba histolytica* recovered from a woman in Nashville, Tenn. The culture medium employed was that of Boeck-Drbohlav, consisting of coagulated egg-Ringer-solution overlaid with horse serum diluted in Ringer 1 in 10 and with the addition of rice flour.

In July 1941 the strain was brought to New York where it has been continuously cultivated. In the summer of 1943, it was found that larger amoebae were appearing in the culture and this was thought at first to be due to contamination with a strain of a large race. Later enquiries showed that the same experience had occurred in the case of the strain retained in the laboratories in Nashville (Vanderbilt University School of Medicine); the strain there had in fact been discarded because it was believed to have become contaminated by another.

In New York, the strains were carried in a medium which had been modified from the original. Normal saline was used instead of horse-serum Ringer for one set of transplants and 0·5 per cent. liver extract (Lilly) in normal saline for another. The large amoebae occurred in both types of media. They have now persisted up to July 1947.

In 1944 measurements of 600 trophozoites in 24-hour transplants were made. The mean diameter was about 19·0μ (range 11·2 to 37·6μ). In fixed and stained specimens, the mean diameter of 200 trophozoites was about 16·0μ (range 8·3 to 26·0μ). In 1938, the figures had been respectively 8·5μ (7·0 to 13·5μ) for trophozoites in culture and 7·5μ (5·0 to 11·0μ) in fixed and stained specimens. Furthermore the smallest amoebae found in 1944 were 3 to 4μ larger than the smallest found in 1938.

Apparently therefore the strain changed from small to large size under some unknown stimulus in the culture medium at the same time in two laboratories a thousand miles apart. This suggests that the small and large races of *histolytica*-like amoebae are the same species and that the size range of strains of *E. histolytica* is a characteristic which may change from small to large and *vice versa* under different environmental conditions.

H. J. O'D. Burke-Gaffney

Shaffer, J. G. & Frye, W. W. **Studies on the Growth Requirements of *Endamoeba histolytica*. I. Maintenance of a Strain of *E. histolytica* through One Hundred Transplants in the absence of an actively multiplying Bacterial Flora.** *Amer. J. Hyg.* 1948, Mar., v. 47, No. 2, 214–21.

Entamoeba histolytica is usually grown on Boeck and Drbohlav's egg-slope medium in the presence of bacteria. Experiments were undertaken in order

to see if cultures could be maintained in the absence of bacteria and to study growth requirements. The strain had originally been isolated by Dobell from a Macaque monkey in 1926. The medium was an egg-slant overlaid with 5·5 cc. buffered saline (*p*H 7·0) with a little rice flour. The bacterial flora consisted of a stable complex of three types of Gram-negative, aerobic bacilli and an anaerobic streptobacillus, which with the protozoon forms an interesting symbiotic combination.

When penicillin (6,250–12,500 units) plus streptomycin (10,000 units) were added to each tube, the aerobes were reduced from a proportion of 700 millions to 2 millions, while amoebae continued to multiply. The bacteria were reduced still further by placing 24-hour cultures of bacteria in the water bath at 58°C.; then after four hours' exposure to inactivate the organisms, they were mixed with horse serum, penicillin, streptomycin and trophozoites of *E. histolytica*: 48-hour transplants have been maintained and this procedure was repeated 100 times. The amoebae continued to multiply actively, but subcultures in various media failed to produce bacteria. If the penicillin were inactivated by the addition of penicillase, sub-cultures into fluid thioglycollate showed growth of the streptobacillus quite suddenly on the fifth day of incubation.

The experiments indicate that penicillin and streptomycin have little effect on the multiplication of *E. histolytica* and while they did not completely eliminate bacteria, sufficient were destroyed or rendered static to enable the authors to conclude that actively multiplying bacteria are not essential for the well-being of amoebae. *P. C. C. Garnham*

Shaffer, J. G., Walton, J. G. & Frye, W. W. **Studies on the Growth Requirements of *Endamoeba histolytica*. II. Preliminary Observations on the Cultivation of *E. histolytica* in a Modified Thioglycollate Medium.** *Amer. J. Hyg.* 1948, Mar., v. 47, No. 2, 222–5.

One per cent. by weight of rice flour is placed in 50 cc. of fluid thioglycollate (Baltimore Biological Laboratories) with dextrose, and 0·5 cc. of a 24-hour fluid thioglycollate culture of the streptobacillus [see above] is added. The mixture is incubated at 37·5°C. for 24 hours; it is then shaken and dispensed in 2·5 cc. lots; 2·5 cc. of isotonic salt solution and 0·5 cc. of normal horse serum are added to each tube. Trophozoites are introduced to the bottom of the tube where they multiply in practically anaerobic conditions among the rice grains and streptobacilli. Transplants are made at intervals of 48 hours. If penicillin is added to these cultures, multiplication of the bacteria is inhibited and the amoebae die out after one or two transplants. *P. C. C. Garnham*

Reynes, V. Le problème de l'amibiase. Les associations microbiennes et parasitaires en Cochinchine. **The Question of Associated Bacterial and Parasitic Factors in Amoebiasis in Cochin China.**] *Méd. Trop.* Marseilles. 1948, Mar.–Apr., v. 8, No. 2, 181–92.

Many writers are of the opinion that the dysentery amoeba does not become pathogenic unless there is modification of the medium which it inhabits or there is suitable concomitant bacterial infection. Under these conditions amoebic disease results from antagonism between the host and the parasite. Both experimental and clinical observations throw some light on the factors governing pathogenicity of the parasite.

After consideration of the literature on these subjects the author examines the incidence of amoebiasis and of other intestinal infections in Indo-China from 1920 to the present time. He concludes that many factors, including diet and climate, influence the pathogenicity of *E. histolytica*; to no one in

particular, with the exception of an associated dysentery or paradysentery bacillary infection, can be ascribed a dominant rôle in causing pathogenicity. [This paper should be consulted in the original by those interested.]

A. R. D. Adams

STEWART, G. T., JONES, W. R. & ROGERS, M. A. T. *Streptococcus faecalis* **in** *E. histolytica* **Infections.** [Correspondence.] *Nature.* 1948, June 12, 936.

The senior author has shown that among other changes in the relative distribution of organisms in the faeces during relapsing amoebiasis was an abnormal prevalence of enterococci, principally *Strep. faecalis* [this *Bulletin*, 1948, v. 45, 76].

When a 1 per cent. glucose-broth culture or culture-filtrate of certain strains of *Strep. faecalis* was added to a phosphate-buffered suspension of *E. histolytica* in equal volume, the amoebae disintegrated in 1 to 2 hours. This effect appeared to be due to a substance formed during the fermentation of glucose. It was specific for the organism in the peptone medium containing glucose and did not occur in the fermentation of glucose by coliform or staphylococcal growing cultures.

It is considered probable that the principal metabolite toxic to *E. histolytica* is lactic acid, which shows a similar type of activity against this amoeba *in vitro* in concentrations of 0·05 *M* : such a concentration is readily attained in glucose-broth cultures of *Strep. faecalis* and removal of lactic acid from such cultures almost eliminates their activity.

Young rats were infected experimentally with *E. histolytica* by the method of JONES [this *Bulletin*, 1947, v. 44, 313] and fed with living cultures of the appropriate strains of *Strep. faecalis*. The degree of amoebic infection was consistently lowered : when the cultures were mixed before inoculation, the *E. histolytica* lost its infectivity within an hour.

Enterococci of the *Strep. faecalis* group are normal intestinal flora in man and some animals, principally in the small intestine. The ' hurry ' of the small intestine caused by diarrhoea increases their prevalence in the colon ; thus during the active stages of amoebiasis, *E. histolytica* becomes more intimately associated with *Strep. faecalis*. It is suggested that the process described may possibly play a part in the natural history of an amoebic infection.

H. J. O'D. Burke-Gaffney

HOUSSIAU, F. & CLOETENS, W. Deux cas d'amibiase hépatique tardive. [**Two Late Cases of Amoebic Hepatitis.**] *Bruxelles-Méd.* 1948, June 13, v. 28, No. 24, 1209–17, 4 figs.

MACKAY-DICK, J. **A Case of Septicaemia (Haemolytic** *Staphylococcus aureus*) **confused with Clinical Hepatic Amoebiasis.** *J. Roy. Army Med. Corps.* 1948, Apr., v. 90, No. 4, 171–2.

CHAPMAN, B. M., SCHWARTZ, H. & HAISLIP, D. B. **Unusual Complications of Amebiasis.** *Ann. Intern. Med.* 1948, Apr., v. 28, No. 4, 850–61, 6 figs. [10 refs.]

The authors report a case of amoebic liver abscess in which diagnosis and specific treatment were delayed until the patient was so gravely ill that he died. At postmortem there was no evidence of pyogenic infection of the liver, but an intraperitoneal perforation by one of many abscesses in the liver was found, and this had caused a 1 cm. perforation of the duodenum. The upper part of the right kidney and the right adrenal were involved in the abscess formation. Although no parasites had been found in the stools during life, there was

extensive amoebic ulceration of the caecum and ascending colon, and smears and sections showed numerous *E. histolytica*. On a review of the literature, the combination of complications in their particular case appears to the authors to be unique. *A. R. D. Adams*

D'Mello, J. M. F. **A Case of Amoebic Pericarditis.** *Indian Med. Gaz.* 1947, Dec., v. 82, No. 12, 738–9.

See this *Bulletin*, 1947, v. 44, 715.

Pfeiffer, A. V. **Effect of Streptomycin on** *Endolimax nana in Vitro.* *J. Parasitology.* 1948, Apr., v. 34, No. 2, 142–6, [18 refs.]

"1. *Endolimax nana in vitro* has been subjected to streptomycin sulfate in a range of 20–16,360 units per ml. for periods ranging from 240–384 hours with no apparent detrimental results upon the amoeba.

"2. *E. nana* were subjected to streptomycin residue *in vitro*, in the range of 27–825 units per ml. for 288 hours with no inhibitory effects on the amoeba.

"3. The possibility of using streptomycin in the cultivation of *Endolimax nana* for the quantitative improvement of the culture is suggested."

Luis Carri, E. Equivalente epileptiforme por giardiasis intestinal. [**Nervous Symptoms associated with Giardiasis.**] *Prensa Méd. Argentina.* 1947, Dec. 26, v. 34, No. 52, 2503–5.

The author records the case of a girl, 7 years of age, who showed much restlessness at night, with grinding of teeth, chattering and somnambulism, and, during the day, an 'oculo-nasal tic'—blinking of the eyes with noisy respiration. No cause could be found, but faecal examination revealed vegetative and cystic forms of *Giardia intestinalis*, and *Entamoeba coli* and *Blastocystis*. Treatment by metaquine got rid of the parasites and regulation of the diet and giving of tonics were followed by complete restoration to health, restful and quiet nights and disappearance of the tic. The author, therefore, attributes the symptoms to parasitism by *G. intestinalis*. *H. Harold Scott*

Pramanik, S. **Treatment of Balantidial Dysentery with Hydrarg Biniodide.** *Indian Med. Gaz.* 1948, Jan., v. 83, No. 1, 38.

Report of a case [see this *Bulletin*, 1948, v. 45, 84].

RELAPSING FEVER AND OTHER SPIROCHAETOSES

de Meillon, B., Thorp, J. M. & Hardy, F. **The Relationship between Ectoparasite and Host. I. The Development of** *Cimex lectularius* **and** *Ornithodorus moubata* **on Riboflavin Deficient Rats.** *South African J. Med. Sci.* 1947, Sept., v. 12, No. 3, 111–16.

"1. Experiments in which the activity of the host is not a complicating factor show that *Cimex lectularius* and *Ornithodorus moubata* grow and reproduce normally when reared on riboflavin-deficient rats. Second generation bugs obtained from eggs laid by females reared on a riboflavin-deficient rat are not affected either.

"2. There is no significant difference between the riboflavin content of bugs fed on normal and riboflavin-deficient rats. The riboflavin content of a bug is quite beyond that which it could accumulate throughout its life by feeding on normal rats or human beings.

"3. It is suggested that the source of the riboflavin found in the bugs fed on rats deficient in this vitamin is the intracellular symbionts which every bug is known to possess."

PACKCHANIAN, A. **The Fate of *Trypanosoma duttoni* in *Triatoma*.** *Amer. J. Trop. Med.* 1948, May, v. 28, No. 3, 383–6.

PEÑA CHAVARRÍA, A., SÁENZ HERRERA, C., CORDERO, E. & BOLANOS, L. Enfermedad de Weil en Costa Rica. Estudio de un brote epidémico en la ciudad de San José. [**Weil's Disease in Costa Rica. Study of an Outbreak in San José.**] *Bol. Oficina Sanitaria Panamericana.* 1947, Nov.–Dec., v. 26, Nos. 11/12, 960–66. English summary.

The outbreak investigated occurred in June–August, 1944. Sporadic cases, or small groups of cases, had been observed for several years among children but these had been regarded as cases of catarrhal jaundice. The first patient seen in this outbreak was a child, 5 years of age, who suddenly became feverish, and irritable and had loss of appetite, headache, intestinal disturbance, albuminuria and, after 4–5 days, jaundice. Leptospirae were seen in the urine. She was discharged from hospital after being ill for a little more than a fortnight. In rapid succession other cases occurred, in adults as well as children, and altogether 34 cases were recorded. In all but one, leptospirae were found in the urine or blood and sera agglutinated *L. icterohaemorrhagiae* in dilutions up to 1 : 5,000, and a few *L. canicola* up to 1 : 100 (in one patient 1 : 200). Rats in the neighbourhood were examined and 31 out of 74 had a blood infection; another 4 per cent. showed leptospirae in the urine and 16 per cent. in the faeces, 62 per cent. positive altogether. Examination of the stomach contents of fleas caught on the rats also revealed leptospirae. It is thought, therefore, that this insect may be a vector of infection. *H. Harold Scott*

LEPROSY

LEPROSY IN INDIA. 1948, Jan., v. 20, No. 1, 100 pp. Special Issue. **All-India Leprosy Conference, Wardha.**

This Conference was attended by 74 delegates and a number of politicians. The 100-page report contains little that is new. The first part is taken up with short speeches by politicians from each province and an address by the Director of Health Services, Government of India, and is followed by abstracts of papers and their discussion; these deal with different sections of the work and the resolutions adopted by the Conference. The main part of the report records either in full or in abstract the papers read, which are mentioned in the earlier part, but with no reference to the pages where they are recorded, nor are those of the same subject printed together, which is an inconvenience to the reader. No list of papers or index is supplied.

The following summarizes the most important points, apart from two important subjects, which are dealt with separately below.

A discussion on planning of anti-leprosy work follows the usual lines. Small colonies for 100 patients near their villages are recommended when a near-by medical man is available. The optimum number of cases for larger colonies is considered to be 500. Diverse opinions were expressed regarding the importance of diet. Leprosy control in rural and urban areas is next dealt with and vagrant homes are suggested for beggars, whose trade is said to be a flourishing

profession. Leprosy surveys are considered to be no longer required except as a preliminary to effective anti-leprosy work. In Orissa, a three years' survey of 1,400,000 persons revealed 25,000 cases, about 4,000 of whom were infective.

A long discussion of social and economic aspects of leprosy included full consideration of sterilization of males by vasectomy to prevent children being born to infective parents. This was thought to have a place, but should be a voluntary procedure. The importance of leprosy in children was once more stressed and special institutions for isolating children living with infected persons were advocated by RAMANUJAM (whose paper in summary was presented by COCHRANE), but others thought it better to send them to live with healthy relatives.

As in the case of all recent leprosy conferences much time was expended on reading papers on and discussing the classification of leprosy cases, much to the confusion of most workers on the subject. It was ultimately resolved that it would be unwise to discard completely the Cairo classification, but it should be suitably modified to bring it into line with recent advances. Other resolutions provided for the appointment of an all-India leprosy officer, for more training for leprosy workers, and the admission of leprosy cases to general hospitals; it was agreed that home isolation of children is the cheapest method but is not applicable on a wide scale. Further "immediate steps" should be taken to start colonies and group isolation centres in all seriously affected areas. [It is to be hoped that under national government this may be implemented without further delay, as a similar resolution was passed at the Calcutta 1920 Leprosy Conference at the reviewer's suggestion with practically no effect, except in Madras, in nearly thirty years.] Further propaganda, research and suitable alteration on political grounds of the title Indian Council of the BRITISH Empire Leprosy Relief Association were also resolved on. *L. Rogers*

DHARMENDRA. **Need for Fresh Anti-Leprosy Legislation in India.** *Leprosy in India.* 1948, Jan., v. 20, No. 1, 59–63.

COCHRANE, R. G. **Legislation in Leprosy.** *Ibid.* 91–2. Discussion 25–8.

The papers and discussion on this difficult subject are of importance. The first speaker pointed out that, except under a recent Madras Act, the legislation is out of date in not distinguishing between infective and uninfective cases and is ineffective in only applying to urban areas. Compulsion leads to hiding and is only necessary under special conditions. Moreover, all Indian institutions are full, so voluntary isolation must be mainly relied on. Fresh legislation is required as a Model Leprosy Act with notification and compulsory powers only as regards infective cases in which lepra bacilli can be demonstrated, provision for isolation of all such cases (a very large order) including those in the more highly infected rural areas. In highly endemic areas, legal powers should be mandatory and not only permissive with maintenance of places of isolation for infected cases, and powers for Health officers to examine any cases supposed to be infective. Infective persons should be restricted from the use of public vehicles and from engaging in occupations that may endanger others, and infected paupers rendered liable to arrest and removal. Control of immigration of leprosy patients and regulations regarding measures for effective home isolation should be taken. Leprosy workers should be consulted in the framing of the new Act, which is urgently required for circulation to provincial governments before a final draft is enacted.

The second speaker, Cochrane, with experience of the recent Madras legislation, considered that laws which encourage an atmosphere of fear and drive patients into hiding are bad. The majority of infections are in children and young adolescents and only a minority become infective, and they are not equally

dangerous, so only those most likely to come into close contact with healthy persons need be dealt with. It is impracticable and unnecessary to prevent them from travelling in public conveyances except in the case of prolonged close contact in ship's cabins. It is also quite impracticable in India to isolate all infective patients, and investigation is required to discover the minimum amount of segregation needed to control the disease, so it can only be used in limited areas to meet particular and special circumstances and to prove its efficacy.

After a long and discursive discussion it was resolved that existing legislation should be amended in the light of modern knowledge since present legislative measures are of no practical value. *L. Rogers*

SIMONS, R. D. G. P. Enkele clinische gegevens over een 87-tal lepralijders. "Biotropisme indirecte lépreuse" der anti-syphilitische behandeling. Photosensibilisatieproef op de na lepra. [**Clinical Features. Indirect Biotropism and Photosensibility Testing in Leprosy.**] *Nederl. Tijdschr. v. Geneesk.* 1948, May 29, v. 92 (ii), No. 22, 1612–19, 7 figs. (6 on 1 pl.) English summary (6 lines).

Many interesting features of leprosy are recorded in this study of 87 leprosy patients, in whom the diagnostic complications of syphilis and skin diseases were increased by avitaminosis and nutritional disturbances acquired in concentration camps. Leprosy manifested itself in the accepted forms of lepromatous and nerve leprosy, but the latter showed not only as "hansenides" (tuberculoid) but also as "intermediate" forms. It is evident that when dealing with the signs of leprosy, definition of terms is very necessary and that care must be taken over the significance of terms such as tuberculide, tuberculoid, syphilide and lepride. The leprosy "macula" also may be a raised patch and not the dermatologists' macula.

Among these patients there appeared useful leprotic signs such as madarosis (loss of eyebrows), *vox leprosa*, gynaecomastia, claw hand and "*rougeur érysipéloide.*" Those doctors who work in leprosy-ridden countries are probably on the look-out for typical and atypical manifestations of leprosy. Two unusual manifestations among many others are described here. The first is cited as a case of "indirect leprous biotropism." Direct biotropism is the reaction brought out, say, in syphilis by a specific provocative dosage: the indirect reaction is that pertaining to some other disease, say, a malarial attack which is precipitated by antisyphilitic treatment. In the present instance a 20-year-old patient with primary syphilis, after his ninth injection, developed a typical acute leprosy reaction with leonine facies and acid-fast bacilli in his nasal mucus. He had evidently been at the same time a case of latent leprosy.

The second case was peculiar: an 18-year-old blonde youth with declared photosensitivity of the skin upon treatment with bergamot oil and exposure to sun. He was a case of nerve leprosy and many of his neurotrophic leprous skin areas, although devoid of lanugo hair and showing altered pain and temperature sensation, analgesia and thermo-anaesthesia, but not touch sensation, were immediately revealed by application of bergamot and exposure to the sun. This should have been followed by a dermatitis and subsequent darkening of the reaction areas. The leprous maculae, however, remained depigmented as vitiliginous leprides, the areas of analgesia in which, in some cases, were only punctiform.

The lepromin and pilocarpine tests in these leprous patients followed well-known lines. *W. F. Harvey*

DHARMENDRA & CHATTERJEE, K. R. **Treatment of Leprosy with the Sulphone Drugs.** *Leprosy in India.* 1948, Jan., v. 20, No. 1, 71–5. [12 refs.] Discussion 32–4.

This trial was carried out on 50 advanced and lepromin negative lepromatous cases in a Calcutta hospital over a period up to 19 months ; during the course of treatment blood changes were watched and a diet with increased proteins and vitamin B was given. Promin, diasone and sulphetrone were administered in the usual doses. The first was found to be too toxic, but the last two given orally proved to be more effective than any other treatment, although slow in their action. Simple estimations of haemoglobin only sufficed to enable consequent anaemia to be combated, because its decline runs parallel to that of the red corpuscles and it is not necessary to estimate the concentration of the drugs in the blood except for research purposes. Only a few of the patients failed to tolerate the treatment. Improvement is seen in the form of subsidence in the extent of large infiltrations and nodules and disappearance of small nodules. Leprotic ulcers, including nasal ones, heal quickly and do not recur, and eye conditions improve. Reactions are checked and become less frequent. On the other hand, bacteriological improvement was not marked and in only two cases did smears become negative although in others the numbers of bacilli were generally less. These drugs had no effect on nerve pains and nerve abscesses, and loss of sensation did not show any improvement. Altogether the effects were less than those described by others and these preparations have definite limitations, but the new treatment is considered to be safe, if the precautions already mentioned are taken. Hydnocarpates, therefore, remain the best routine treatment in the generality of cases and especially in many neural ones.

In the discussion which followed, Cochrane repeated his view that the sulphone drugs should be restricted to experimental trials until more experience is acquired, but in his reply Dharmendra said there was no justification for holding back the use of these drugs by general practitioners so long as the necessary simple blood examinations and other necessary precautions were taken. A. T. ROY advocated giving hydnocarpus oil in a few courses of big doses followed by smaller ones ; he considered that this produced the best results. *L. Rogers*

HELMINTHIASIS

LOVETT-CAMPBELL, A. C. **A Note on Bilharziasis in West African Troops.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 821–2, 1 fig.

Of 532 military recruits admitted to a hospital in Northern Nigeria in 19 months between 1940 and 1942, 74 had schistosomiasis [this is shown as 18 per cent., but is in fact 13·9 per cent.].

S. haematobium accounted for 59 cases, *S. mansoni* for 11 and a combination of both for four : one of the last named died. Hookworm and ascarid infections were also present in 60 per cent. of the infected group and *P. falciparum*

malaria in 5 per cent. Haemoglobin varied between 65 and 85 per cent., and eosinophilia from 6 to 19 per cent. Red cell counts were never below four million per cmm. Treatment was by means of anthiomaline: response to this drug alone was slow, so a concluding course of sodium antimony tartrate was given in each case.

The men had been medically examined on enlistment and those infested with schistosomes had been either rejected or treated. It is therefore likely that the present infestations were either those overlooked on enlistment or relapses after inadequate treatment: had they been new infestations contracted during manoeuvres, a much higher percentage would have been expected.

Contrary to a belief held at the beginning of the war that schistosomiasis caused little physical impairment in recruits, infested men soon broke down under prolonged stress. This was especially noticeable on long marches and a distinctive triad of symptoms was common, namely backache in the loins, caecal tenderness and mucoid diarrhoea. Where backache predominated, vesical lesions tending to encroach on ureteral orifices were seen on cystoscopy. Caecal tenderness, indicating large bowel involvement, was common in *haematobium* as well as *mansoni* infestations and one soldier had gross *haematobium* lesions in the appendix.

In an endemic area in the Sokoto Province, 57 per cent. of 35 appendicectomies revealed schistosome infestation. Appendicectomy is usually indicated in schistosomiasis where caecal tenderness remains after specific drug therapy or radiography shows imperfect filling or delayed emptying or a retrocaecal appendix. *H. J. O'D. Burke-Gaffney*

MEESER, C. V., ROSS, W. F. & BLAIR, D. M. **The Diagnosis of Rectal Schistosomiasis.** *J. Trop. Med. & Hyg.* 1948, May, v. 51, No. 5, 91–4.

A diagnosis of rectal schistosomiasis is usually based on the recovery of ova of the worms from the stools. In S. Rhodesia, where the severer dysenteric form of the disease is rarely seen, even serial stool examinations may reveal but an occasional egg. Here, in many cases giving a positive intradermal test with a cercarial antigen, eggs cannot be found in the stools; but, postmortem, infection of internal organs can be demonstrated by a potassium hydroxide digestion technique in these cases.

In 1921 FÜLLEBORN [this *Bulletin*, 1923, v. 20, 219] described a concentration technique for the recovery of schistosome ova from stools and the recognition of their presence by hatching. A modification of this method has been employed in S. Rhodesia. In 1943, OTTOLINA and ATENCIO [*ibid.*, 1944, v. 41, 945] examined the diagnostic results yielded by liver puncture and by rectal biopsy in schistosomiasis. GELFAND (1948 in the Press) is stated to have found rectal biopsy a successful method of diagnosis of schistosomiasis in S. Rhodesia. HERNANDEZ MORALES and MALDONALDO (1946) [*ibid.*, 1947, v. 44, 330] found the biopsy method to give 100 per cent. positive results, as compared with a 40 per cent. result yielded by a stool concentration technique. KHALIL and SALAH EL DIN (1930) [*ibid.*, 1930, v. 27, 963] compared the results obtained from direct stool examination from a stool flotation technique and from rectal swabs. Of these, the rectal swab method gave the higher number of positive results in rectal schistosomiasis. WELLER (1947) [*ibid.*, 1947, v. 44, 599] designed grooved rectal scrapers and by this method detected 60 per cent. of cases, while an acid-Triton-NE-ether faecal concentration technique in his hands revealed 76 per cent. positives.

The authors examined 50 unselected Africans in the Salisbury Native Hospital for rectal schistosomiasis, using (1) their cercarial antigen intradermal

test, (2) rectal biopsy, and (3) a Weller's three-grooved scraper as diagnostic procedures. Of these, 41 gave positive intradermal tests, 27 gave positive rectal biopsies, and only 2 were found positive by Weller's scraper technique ; 4 were negative as judged by all these tests. A further series of 17 cases was examined by biopsy and by Weller's scraper ; 14 of these were shown to be positive by biopsy, but only one with the scraper ; this latter was a case not revealed by biopsy. Ten other cases of schistosomiasis with *S. mansoni* ova in the stools were examined by Weller's technique, and from only one of these did the scraper recover eggs.

Weller's scraper therefore proved an unsatisfactory instrument for the detection of rectal schistosomiasis as encountered in S. Rhodesia. The reason for Weller's own success in its use may be attributable to the fact that *S. mansoni* infestations are much heavier in Egypt and in the Caribbean area than in S. Rhodesia, where diarrhoea, with the passage of blood and mucus, rarely results from them. Furthermore the scraper takes material only from the lowest 9 cm. of the bowel, while biopsy yields material from a level about 15 cm. up the bowel.

In 5 cases with negative intradermal tests biopsy yielded eggs. Eggs obtained by biopsy are not always viable ; in many cases they were seen to be dead and degenerate. Their presence, therefore, while it constitutes residual evidence of an infection, does not necessarily indicate a need for specific treatment. Old-standing cases of rectal schistosomiasis may be self-cured, and specific treatment is necessary only when the eggs are demonstrably viable.

In S. Rhodesia, cases of infestation with worms producing terminal-spined ova far outnumber those harbouring *S. mansoni*. The rectal biopsy technique revealed a much higher incidence of terminal-spined egg infestation than did stool examination ; Weller's scraper usually failed to reveal intestinal infestations with terminal-spined eggs. It would seem that terminal-spined eggs have difficulty in escaping from the gut wall into the intestinal lumen.

A. R. D. Adams

MAKAR Bey, N. **Two Interesting Cases of Bilharzial Papilloma and Epithelioma.** *J. Roy. Egyptian Med. Ass.* 1948, Mar., v. 31, No. 3, 217–21, 1 coloured fig., 2 photos & 4 microphotos on 6 pls.

In the first case, the patient, an Egyptian male of 25, suffered from a large ulcerating cauliflower-like mass which protruded from the anus. He had a past history of intestinal and urinary bilharziasis which had been treated repeatedly : dead schistosome ova were found in the urine and stools, and X-rays showed " bilharziasis of the bladder." A course of tartar emetic was given and the growth was removed later by diathermy in two sittings. The pathological report revealed that the growth showed " the typical structure of bilharzial polyposis." It contained many living and dead ova, but no malignant changes were seen. The author points out that such advanced conditions are not commonly seen nowadays, and he is of the opinion that neither tartar emetic nor any of its substitutes affect the fully developed bilharzial lesion, possibly because of fibrosis obstructing the vascular channels. The advantages of the form of operation employed are discussed.

The second case was that of an Egyptian male of 40, complaining of a warty mass on the inner aspect of the right thigh, below the crease of the groin. It had begun in the form of nodules in the skin three years before. There was a history of haematuria occurring 2 or 3 years before the skin nodules developed. *S. haematobium* ova were present in the urine.

After a course of tartar emetic had been given, the mass was excised. Schistosome ova were found in the dermal papillae and superficial corium. Parts of an ulcerated area of the growth were typically epitheliomatous. The patient received radiotherapy and was apparently cured when he left hospital.

The author points to the rarity both of schistosomal lesions in such a site and of the appearance of epitheliomatous changes in them where the skin is not exposed to such irritants as occur when the lesions exist at muco-cutaneous outlets.

Because of this rarity and the initial difficulty in diagnosis, the case was at first thought to be one of leishmaniasis with superimposed epitheliomatous changes.

[See also this *Bulletin*, 1947, v. 44, 1011.] *H. J. O'D. Burke-Gaffney*

GELFAND, M. **The Prognosis in Schistosomiasis.** *J. Trop. Med. & Hyg.* 1948, June, v. 51, No. 6, 112–19. [28 refs.]

The gravity of schistosomiasis as a cause of disablement and of death among Africans in S. Rhodesia is examined. Digestion of the rectum and of the bladder obtained *post mortem* from 300 adult natives of Mashonaland showed 94 per cent. to be infected with schistosome ova.

Cirrhosis of the liver occurs in 8 per cent. of Africans, and primary liver carcinoma in 1 per cent. of them; although often ascribed to schistosome infection a similar incidence of these conditions has been reported from schistosome-free areas. The author does not accept schistosomiasis as a cause of liver cirrhosis and believes this to be due to some other factor, such as protein deficiency. The liver changes in schistosomiasis are localized around the eggs, and there is no alteration in the main hepatic structure or evidence of liver failure. Almost half of the schistosomiasis patients had ova in the lungs; but hypertrophy and dilatation of the right heart due to pulmonary arteriolar obstruction, Ayerza's syndrome, and pneumonia and other pulmonary disorders attributable to the infection were not found at the 300 post mortem examinations, Though schistosome infection of the appendix is common, acute and chronic appendicitis are rarities in the Bantu.

Stricture of the ureters with back-pressure hydronephrosis is much less frequent than dilatation of the ureters; hydronephrosis may be associated with this dilatation owing to impairment of the peristaltic function of the ureter because of its thickening; the back pressure may be augmented by reflux of the urine from the bladder through the incompetent ureteric orifice. Eighty-three (33 per cent.) of 250 cases had gross lesions of the ureters, and of these about 27 per cent. consisted of dilatation alone; only 3 per cent. showed stenosis. Fifteen per cent. of the 83 (5 per cent. of the total cases) had hydronephrosis, which was usually associated with ureteral dilatation. In only 1 per cent. was the hydronephrosis responsible for death. Nevertheless, 60 per cent. of those with lesions in the bladder have ova in the ureters, and half of these do develop either dilatation or stricture of the ureters; a percentage of these suffer from hydronephrosis which will in some cases ultimately cause death.

Acute inflammatory infections of the urinary tract due to schistosomiasis are not clinically common, and rarely do they cause death. Stone formation is extremely rarely due to the schistosomiasis *per se*; vesical carcinoma is relatively uncommon, occurring in only one quarter as many cases as primary carcinoma of the liver. Carcinoma of the bladder indeed is less common than in Europeans, in spite of the high incidence of vesical schistosomiasis in the Bantu. The effect of schistosome infection on other organs is problematical. The author

considers that schistosomiasis is not as serious a disease as is claimed in the literature, and that its true gravity is primarily due to its effect on the ureters.

A. R. D. Adams

[Much of this paper deals with schistosomiasis without distinction of species; although the author's observations on lesions of the urinary tract refer specifically to *S. haematobium* infections, he does not always indicate which species is concerned in other lesions. He does, however, state that his findings do not bear out the current belief that *S. mansoni* has a greater predilection for the liver; and in his own experience he found *S. haematobium* ova in the liver in just under 50 per cent. of the cases, but those of *S. mansoni* in just over 23 per cent. He also quotes SHAW and GHAREEB (this *Bulletin*, 1938, v. 35, 665) who conclude that Ayerza's disease may result from either species. In the section dealing with appendicitis, no indication is given of the species of schistosome involved. It is of some importance, in papers dealing with schistosomiasis, that whenever possible the species concerned should be indicated so that subsequent references in the literature may be clearly related to the particular aetiological form of the disease. *Ed.*]

HALAWANI, A., WATSON, J. M., NOR EL-DIN, G., HAFEZ, A. & DAWOOD, M. **Miracil D: a New Chemotherapeutic Agent for Bilharziasis.** *J. Roy. Egyptian Med. Ass.* 1948, Mar., v. 31, No. 3, 272–84.

Miracil is a new compound, 1 methyl-4-beta-diethyl-amino-ethyl amino-thioxanthone HCl [this *Bulletin*, 1948, v. 45, 526].

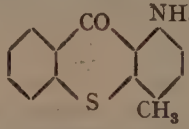
The compound was given orally to 16 patients infected with *S. haematobium*, who were subsequently examined at weekly intervals for 2½ months. Ten received total doses of 2 to 5 gm. during 5 to 10 days; apart from one very light infection, none of these was cured. Three patients were given 7·5 gm. during 8 to 10 days; two were cured and one relapsed. The concentrations of miracil in the blood mostly ranged from 0·12 to 0·37 mgm. per 100 ml. In ten cases the drug caused slight increases in the systolic blood pressure and in the pulse rate. Among the symptoms reported by the patients were:— giddiness (10 patients), vertigo (1), weakness and inertia (2), headache (2), epigastric pain (2), colic (2). The patient with vertigo suffered severe and repeated attacks of giddiness beginning 7 days after taking the last of 3 doses of 0·4 gm. each, given at intervals of two days; these attacks lasted for 9 days and then diminished in intensity. (This patient also showed a rise in blood urea from 24 to 35 mgm. per 100 ml.) Giddiness also required discontinuance of the treatment in two other patients receiving 10–12 mgm. per kgm. daily (*i.e.* 0·5 gm. twice daily for several days). Muscular twitching occurred in a few patients and excessive sweating in others. The skin was stained yellow. One patient weighing 45 kgm. who had received 1 gm. daily for 7 days developed an erythematous rash over the body and face; this disappeared after a few days. Apart from the case of the one patient mentioned above, there was no change detected in kidney function, in hepatic function, or in the blood. In three cases, temporary changes were observed in the heart. Three of the patients treated also suffered from *S. mansoni* dysentery; two were not cured, one (apparently) was sterilized temporarily but relapsed. In cases which responded, the excreta became negative 7–10 days after the end of treatment. Apparently miracil does not have a direct action on the eggs. Three additional patients were each given 1 gm. daily for 7 days; and viable ova had completely disappeared within three weeks of the end of treatment.

It is concluded that the effective dose of miracil is not less than 18–20 mgm. per kgm. daily for 7–8 days, and that the blood concentration must reach 0·3 mgm. per 100 ml.

F. Hawking

HAWKING, F. & ROSS, W. F. **Miracil D, its Toxicology, Absorption, and Excretion in Animals and Human Volunteers.** *Brit. J. Pharmacol. & Chemotherapy.* 1948, June, v. 3, No. 2, 167–73, 2 figs.

Miracil D, synthesized in Germany, is the hydrochloride of 1-methyl-4-β-diethylaminoethylaminothioxanthone



and showed promise against infections of *Schistosoma mansoni* in mice. The present authors have studied its effects and blood levels in mice, rabbits, monkeys and human volunteers. It has an irritant action on tissues, giving rise to inflammation and necrosis at the site of injection and it causes slight spasm of intestinal muscle. It is more toxic when given intravenously and may produce venous thrombosis. Oral dosage proved most satisfactory. Details of dosage are recorded. In man, 0·2 gm. repeated daily was tolerated. The method of LATNER *et al.* [this *Bulletin*, 1948, v. 45, 96] was used for estimation. When the drug was given orally in a single dose, absorption was rapid and the blood level attained in some animal experiments was constant for at least 21 hours, but was not always proportional to dosage. In man the concentration in leucocytes, plasma and red cells was in the order given. The drug was present in most tissues of the body. About 7 per cent. of an ingested dose was excreted in urine and less in faeces, and the drug disappeared from these excretions in 2 to 3 days after treatment. About 90 per cent. appeared to be degraded in the body with consequent little tendency for accumulation. In animals, overdosage caused pathological changes in liver and kidney, while in man nausea, prostration, insomnia and yellow discolouration of skin and sclerotics were encountered. *J. D. Fulton*

MARILL, F. G. La bilharziose vésicale en Algérie. Programme de prophylaxie. [**Urinary Schistosomiasis in Algeria: the Programme for Prevention.**] *Cahiers Méd. Union Française.* Algiers. 1947, Nov., v. 2, No. 14, 677–91.

In January 1947 a focus of infection with *Schistosoma haematobium* was found at Fondouk, and known foci exist at Djanet and Saint-Aimé-de-la-Djidiouia. The Fondouk focus is only 38 kilometres from Algiers.

Schistosomiasis may be introduced into Algeria from Southern Tunisia, Morocco, and especially from south of the Great Atlas mountains, but there are now these several established foci in the country, and in many other places *Bulinus* snails are found. The author mentions *Bulinus truncatus* (and *B. contortus*, *B dybowski* and *B. innesi* which others regard as synonyms of the first), *B. raymondianus*, *B. brochii*, *B. brondeli* and *B. maresi*. He makes the point that if snail hosts are present in collections of water, prolonged contact with carriers of the infection is necessary before a focus is started. Irrigation canals are suitable for snails and for human contact, and the disease is largely associated with irrigation systems. The smaller canals are most frequently infested. In Saint-Aimé the number of snails has diminished as a result of deliberate periodic drying of the canals, but this is probably not enough to account entirely for the diminution that has taken place; other influences have probably affected this comparatively new colony of snails, but they are not understood. Cemented canals in that area contain only *Melanopsis*; earth canals contain chiefly *Bulinus*, and only rarely other genera.

The author discusses control. The number of foci of snail hosts in Algeria is so large that in practice they cannot be dealt with ; but the foci connected with irrigation can be controlled, and on these all efforts should be expended. Patients should, of course, be treated, especially soldiers drafted into these areas from Morocco and elsewhere ; but examination by cystoscopy has shown that 80 per cent. of African soldiers may be affected, and the trouble and expense of a complete treatment programme would be so great that it is doubtful if it could be carried through. Workmen entering from Southern Morocco should be examined at the frontier, but frontier posts are very easily avoided. Nevertheless, it is possible to control these men so that they are not permitted to stay or work unless certified as free from schistosomiasis.

For control of snails it is necessary that engineers and others engaged in irrigation work should constantly bear in mind that snail elimination is an essential part of the work. In each irrigation system there should be a full-time sanitary section directed by an expert chief. Earth canals should be cemented. Canals should be dried periodically—at Saint Aimé, experience has shown that *Bulinus* snails cannot withstand 6 hours of summer sunshine in a dried cement canal, but shade along the edges prevents this lethal action. Earth canals give much more protection to the snails. Certain sections of canal, and the larger canals, can rarely be dried, but the author suggests that these larger channels might be doubled and therefore used alternately, or provided with sluice-gates at intervals so that sections may be dried in turn.

Copper salts may also be used, but if a copper compound were introduced to a strength of 1 in 200,000, which is usually required for *Bulinus*, there would be needed, for the Saint-Aimé system alone, some 650 tons each year. If, however, copper salts are reserved for parts of the system permanently under water—siphon pits, small reaches, pools, etc.—which form the reservoirs of snails, they may be most useful.

Such measures are useful for the control of schistosomiasis, but they are also of considerable value for the control of malaria in that they entail careful watch on permanent collections of water. Each irrigation system, however, presents its own peculiar problems. *Charles Wilcocks*

Kourí, P. Diagnostico, epidemiologia y profilaxis de la Fascioliasis hepatica humana en Cuba. Sindrome eosinofílico febril. [**Diagnosis, Epidemiology and Prophylaxis of Human Fascioliasis in Cuba.**] *Kuba*. Habana. 1948, Mar., v. 4, No. 3, 63–7. [48 refs.]

Clinical diagnosis of infestation by *Fasciola hepatica* is not easy ; the main symptoms are those of cholangitis, cholecystitis and hepatic colic which may, of course, be due to several other causes. Finding of the ova in the faeces is conclusive but not infrequently the diagnosis has been made when an operation is in progress, or even at autopsy. Eosinophilia, especially if of an epidemic character and accompanied by prolonged fever and leucocytosis, perhaps with shivering and a painful enlarged liver, is a helpful indication. Apart from direct faecal examination and the persistent eosinophilia, complement fixation, precipitin- and intradermo-reactions with extracts of the trematode may be tried, but these are not yet established procedures. The therapeutic test—clearing up of symptoms on administration of emetine is not of much value ; an amoebic hepatitis would be cured by the same treatment.

From the epidemiological point of view, the infestation of cattle is all important. One record of 549 cattle slaughtered at the municipal abattoir of Pinar del Rio gave 61·9 per cent. with *F. hepatica* in the bile-ducts.

Generally speaking [no figures are given] " human fascioliasis is more common in the white than in the negro ; more in the middle and upper classes of society

than in the lower ; more in adults than in children and more in women than in men." Prophylaxis comprises, first, avoidance of infestation by filtering and boiling the drinking water and not eating vegetables or fruits grown on soil possibly contaminated ; second, eradicating infestation from animals [not a simple matter with so large a percentage infested] and destroying the intermediate molluscan hosts. *H. Harold Scott*

Pick, F. Précisions nouvelles sur l'anatomie microscopique de *Watsonius watsoni*. [**New Observations on the Microscopic Anatomy of** *Watsonius watsoni*.] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 3/4, 204–5, 3 figs. on 2 pls.

Mandoul, R. & Pautrizel, R. Étude expérimentale du transit intestinal des oeufs de douves. [**Experimental Study of the Passage of Eggs of Liver Flukes through the Intestine.**] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 11/12, 450–52.

The authors urge that caution is necessary before diagnosing human distomatosis due to *Fasciola hepatica*—of which several cases have been reported in France in recent years—by recognition of the eggs passed in stools, since the presence of such eggs, and also those of *Dicrocoelium* may be the result of eating infected sheep's liver. To confirm this opinion, the eggs of these flukes were swallowed by two subjects whose stools were examined subsequently at intervals. Eighteen hours after ingestion, eggs of both species were found which were easily recognizable and continued to appear in the stools in diminishing numbers up to four days later. *J. J. C. Buckley*

Pick, F. & Deschiens, R. Sur la morphologie et l'évolution des oeufs de *Watsonius watsoni* (Conyngham 1904), Stiles et Goldberger 1910. [**The Morphology and Development of the Eggs of** *Watsonius watsoni*.] *Bull. Soc. Path. Exot.* 1947, v. 40, Nos. 11/12, 445–9, 2 text figs. & 8 figs. on 2 pls.

Pick, F. La mise en évidence d'un système vasculaire superficiel chez le trématode *Watsonius watsoni* (Conyngham 1904), Stiles et Goldberger 1910. [**Demonstration of a Superficial Vascular System in** *Watsonius watsoni*.] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 1/2, 34–5, 4 figs. on 2 pls.

Roche, P. J. L. **Human Dicrocoeliasis in Nigeria.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 819–20, 2 figs.

In Yaba, Nigeria, a small trematode, 3·8 mm. in length, was found lying in an intrahepatic bile duct in a section of human liver obtained by viscerotomy in connexion with yellow fever investigations. The eggs were operculated, golden-brown in colour and measured 42μ by 24μ. Some fibrous thickening of the portal tract was the only pathological change produced.

The parasite was identified as a species of *Dicrocoelium* (? *dendriticum*). The appearance of the parasite in the liver is shown in a photomicrograph : it is noted that the acetabulum showed marked development and was 0·34 mm. in diameter compared with the oral sucker which was only 0·26 mm.

There appears to be no previous record of human dicrocoeliasis in West Africa. *H. J. O'D. Burke-Gaffney*

Sanchis Bayarri, V., Paris Pellicer, C. & Garcia Martinez, A. Un caso de parasitismo por el " Strongyloides estercoralis ". [**A Case of** *Strongyloides stercoralis* **Infection in Spain.**] *Med. Colonial.* Madrid. 1948, June 1, v. 11, No. 6, 427–40, 6 figs.

DE MORAES, R. G. Contribuição para o estudo do *Strongyloides stercoralis* e da Estrongiloidose no Brasil. [*Strongyloides stercoralis* **and Infestation by it in Brazil.**] *Rev. Serviço Especial de Saúde Pública.* Rio de Janeiro. 1948, Jan., v. 1, No. 3, 507–624, 18 figs., 4 charts & 1 map. [Bibliography.] English summary.

This is a professorial thesis and therefore aims at completeness. Consequently much of what it says is well known to students of helminthology. The work is divided into four main parts with subdivisions into chapters. In Part I the parasite itself is studied; the author starts with a discussion of its correct nomenclature and systemic position, its history and morphology, with well reproduced photographs and line drawings, its evolution, direct and indirect, the mode of infestation and its bionomics, the effects of moisture, dryness, light, temperature, etc., and a brief statement of its various tropisms—geotropism, thigmotropism, thermotropism and the rest. Part II deals with its pathogeny and pathology; the lesions it produces in skin, lungs and intestine, the blood changes, etc., with photomicrographs showing the effects of its presence on the tissues. Symptomatology is included in this part. Part III treats of the diagnosis by direct faecal examination, by concentration methods and by culture, by duodenal examination and by Baermann's method. Part IV, the most important for us, deals with epidemiology, the world geographical distribution and then distribution in Brazil in particular. A table gives the findings recorded by various observers from the time of Lutz (1885) to Moraes (1947). All but the last-named used direct methods or the duodenal sound, whereas Moraes used Baermann's method in the Rio Doce Valley, Espirito Santo and Minas Gerais, and found 58·3 per cent. positive. Comparing Faust's method with that of Baermann the percentages positive among 114 cases were 19·2 and 64 respectively, clear evidence of the superiority of the latter. The 58·3 per cent. in the Rio Doce Valley comprised in all 1,007 cases, whites, negroes, adults and children. Race and sex appeared to have no influence, but the peak for age was 10–14 years among whom 70·5 per cent. were positive.

A final chapter on the correlation between strongyloidiasis and ankylostomiasis is instructive; a graph shows that the percentage figures ran almost parallel throughout the 12 months August 1943–July 1944, that of hookworm being rather more than double that of Strongyloides. *H. Harold Scott*

GALLIARD, H. Races géographiques de *Strongyloides stercoralis*. [**Geographical Races of** *Strongyloides stercoralis*.] *C.R. Soc. Biol.* 1948, Jan., v. 142, Nos. 1/2, 50–52.

Galliard holds that geographical races of *S. stercoralis* exist which are characterized by the degree of their infectivity to dogs or cats and by the nature of their exogenous development. He quotes examples from literature illustrating the first point, remarking that whereas in Indo-China he found that the dog is very susceptible to infection with *S. stercoralis* from man, Fülleborn in China found the dog to be very refractory; again, in Calcutta the cat is commonly infested with *Strongyloides* but in Tonking, where it has never been found naturally infected, it is somewhat refractory to infection with *S. stercoralis*. Further experimental evidence of geographical strains of *S. stercoralis* was forthcoming when dogs in Tonking, which are susceptible to the local strain of *S. stercoralis* from man, were exposed to human strains from the Antilles and Africa respectively. It was found that not only was the dog refractory to these two strains, but that there was a marked difference in the character of the two strains in respect of their behaviour.

J. J. C. Buckley

O'Neal, Ruth & Magath, T. B. **Trichostrongylus Infection of Human Beings : Report of Three Cases.** *Proc. Staff Meetings Mayo Clinic.* 1947, May 14, v. 22, No. 10, 193–7, 2 figs.

Trichostrongylus infections were diagnosed by finding eggs in the stools of two boys aged 5 and 7 respectively, and a man of 38 years. The two boys had lived in the Belgian Congo and French Equatorial Africa from an early age and the adult had spent 13 years in Korea.

A good series of photomicrographs illustrates the progressive development of the eggs up to the embryonated stage. The eggs measured from 76 to 86μ in length by 44 to 47μ in width. *J. J. C. Buckley*

Biyal, N. Ueber die Wirkung des Reinbenzins auf die Darmparasiten und seine Folgen. [**The Effect of Pure Benzene on Intestinal Parasites.**] *Schweiz. med. Woch.* 1948, June 12, v. 78, No. 23, 571–2.

Petroleum and benzene have been used for some years in Anatolia in the treatment of intestinal parasites, particularly by veterinarians for treating ascariasis and strongyloidiasis in horses, and the author has undertaken a study to determine the uses of benzene and whether its exhibition has any disadvantages and sequelae. The benzene on the market is not pure ; it is mixed with 15 per cent. methyl alcohol and lead and is, therefore, dangerous. By distillation a pure product has been obtained. Starting with 0·3–0·6 cc. for each year of life as a minimal dose he obtained no result, so he gradually increased it to 20 cc. for a child of 2–5 years, 30 cc. for those between 6 and 14 years, and 60 cc. for an adult. Burning sensation in the stomach and anus was obviated by giving the drug emulsified in syrup and gum arabic with a little oil of peppermint. It is given in the morning, before food is taken, and is followed by a purge of sodium sulphate. After 2–3 hours, light food may be given such as soup, milk-pap, potato consommé, fruit juice, etc.

In this way the author has treated 57 cases of ascariasis, 48 of taeniasis, 45 of oxyuriasis, 5 of ankylostomiasis and 14 of mixed infestations. Relapses have been observed in 7, 4, 8, 1 and 0 respectively. Symptoms of intoxication are few and slight, in fact, almost negligible ; they included a tendency to drowsiness, some giddiness and nausea, rarely vomiting and burn sensations in the stomach and at the anus. In animal experiments as much as 6 gm. per kilo was given to dogs without producing any toxic symptoms.

H. Harold Scott

Lane, C. **Bancroftian Filariasis. Biological Mechanisms that underlie its Periodicity and other of its Clinical Manifestations.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 717–84, 7 charts & 58 figs. on 20 pls. [Numerous refs.]

Opinions as to the causes of microfilarial periodicity have so far been mainly based on theory. Some authors, like Poynton and Hodgkin [this *Bulletin*, 1939, v. 36, 149], despairing of any satisfactory explanation, dismiss the matter as of little importance, save as a fact, but by others it is regarded as embodying a vital principle. It is claimed by Lane that speculation on this subject has so far been based insufficiently on histological studies ; but these have now been made possible as a result of some 800 filarial sections bequeathed to him by the late Professor F. W. O'Connor. Reviewing the historical aspect of the mechanism of periodicity Myers (1881) held that the parturition of female filariae was continuous and that the embryos remained in the lymphatic system for 12 to 24 hours ; when they entered the bloodstream they were destroyed during the daylight hours. Manson (1882), on the other hand,

suggested that reproduction was continuous, but that the embryos were filtered out in the lungs during the daytime. He thought that the object of Nature in making this creature so prolific was to provide as many chances as possible for the continuance of the species, and so he found it difficult to understand why animalcules which can live many days *outside* the body of their host should die after so short a life *within* it.

From a reconsideration of Manson's data on the numbers of microfilariae present at the same hours in the blood and in lymph measured by chyle deposited in urine, it appeared that a periodicity in the lymphatics was emphatically present, but according to Lane, this differed from that in the blood by observing a morning peak. At first it appeared to Manson that filarial disease, such as lymph scrotum, could be brought about by the activities of one parent worm, but Myers recorded that the human host could harbour many at the same time. From O'Connor's serial sections it has been confirmed that 80 worms (either killed by the fixative or already defunct) could be found in a set of inguinal lymph glands in one case, and over 30 in a second. Therefore periodic parturition by one single worm cannot be held to account for the cyclical appearance of embryos in the peripheral blood.

Since the acceptance of ASCHOFF's conception of the function of the reticulo-endothelial system as a destructive and defensive mechanism, and by taking this into account, the long life of the microfilaria outside the body can no longer be taken as evidence that an equally long one can be expected within the human host. Nor could Manson visualize that, though a great mortality of the microfilariae would ill serve the parasite, it would ultimately benefit the human host. Thirdly Manson did not appreciate the fact that the lymph flow does not cease at death, but that at *post-mortem* the flow of lymph may be prolonged or even increased, so that after death it may have borne microfilariae into unexpected situations. Therefore his findings that microfilariae harbour by day in the lungs and the larger systemic arteries and thereby produce periodicity by disappearance from the skin blood can no longer be accepted as correct [but see reviewer's comment, below]. It was in 1929 that Lane, on the arguments stated above, formulated his cyclical parturition theory. He found himself incapable of conceiving a possible daytime withdrawal of microfilariae from the cutaneous to the deep capillaries. If this was the case then there must be either a periodic contraction of these capillaries, or a periodic posturing of microfilariae within them during the day. In the case of the nocturnal *W. bancrofti* these forces would have to come into action by day only, by night in the case of *L. loa*, and at no time in the cases of *A. perstans* and the non-periodic Pacific variety of *W. bancrofti*. What would happen in a double infection of two species of periodic microfilariae under these conditions beggars imagination.

As is well known, Lane's theory postulates that periodicity must be due to simultaneous microfilarial parturition once in 24 hours by the females, and the periodic destruction of these newly-born embryos within the organs each and every day. At this point the story digresses to discuss the pertinent question of the mechanism underlying the regular rhythms of inflammatory attacks in Bancroftian filariasis. A possible route by which microfilariae may migrate from the vicinity of the parent worm in the lumen of the lymphatic through its walls to neighbouring small blood vessels, on their way to the general circulation, has now been demonstrated, though it is not claimed as the normal method. It has been believed that death and destruction of microfilariae in process of transit cause attacks of acute inflammation. Thus O'Connor thought that in sections of a lympho-varicocele he had obtained visual evidence of this transit. The larval sheaths (as in other nematode larvae) are separated, but enclosing cuticles which are cast at the last ecdysis, and therefore should be

discarded in this transit. During the development of the larva in the intermediate host it escapes from the sheath by fixing the anterior end of the sheath against an obstacle and by boring through it towards that obstacle. Normally this is the midgut of the mosquito, but this thigmotactic urge, it is claimed, is present during its sojourn in the human definitive host, and is revealed by the actual presence of discarded sheaths in the viscera [illustrated by two microphotographs in the text, the interpretation of which is open to some doubt]. On the other hand, penetration of tissue, *without loss of sheath*, is possible as has been demonstrated by HARWOOD in *Litosomoides pattersoni* of the cotton rat.

Mammalian striped muscle is exceptionally rich in lymphatics and is a possible route (lymphatic escalator) for microfilariae from the pleural lymph sac along the rich plexus of the diaphragm towards the great veins. On the other hand, active penetration of *Mf. bancrofti* from lymph to blood must be a rare event because otherwise sheathless microfilariae would commonly be found in blood preparations.

No evidence, however, has been forthcoming that acute inflammatory attacks are connected with massive birth of microfilariae, to their subsequent burrowing through the tissues or to their death in these situations. On the other hand Lane believes that a superadded bacterial infection is much more likely to be responsible for acute lymphangitis. For the species to survive it is obvious that the numbers of circulating microfilariae must be kept up by new births in order to make good the wastage. Should these births take place periodically at the time of, and be the cause of, fever and inflammation, then a number must reach the bloodstream, and therefore an increase in the number of circulating microfilariae should be expected, but just the reverse is the case.

Some space is devoted to the fifth theory [KHALIL, this *Bulletin*, 1939, v. 36, 326]. This assumes a more or less continuous parturition, and the course of periodicity is ascribed to special siting of parturient female worms, to gravity, and to periodic flow of chyle, but there is no evidence that any of these factors is operative.

YOKOGAWA's theory (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1939, v. 33, 363) is even more unlikely. He suggested that the periodicity of microfilariae is chiefly controlled by the diurnal and nocturnal alterations of the physiological functions of the reticulo-endothelium. There is no proof whatsoever that such an intrinsic variation of activity of this system is operative.

Evidence is now offered that in periodic Bancroftian infection two opposing forces operate (1) synchronized peristaltic parturition; and (2) local macrophage activity in the lymphatics and lungs, which brings about complete or partial destruction of the microfilariae.

The points to be established should be that: (1) Periodicity was established at the time the specimens were procured. (2) The worms studied had been killed at the time the tissue was fixed. (3) All the female filariae were in the same stage of parturition. (4) The uterine state corresponded to a synchronized periodic emptying. (5) The phases of microfilarial blood tide were in accord with the differences in the uterine content.

In order to give effect to his findings, a detailed description is given by the author of the tubular genital tract of the female *W. bancrofti*, special attention being directed to the vaginal pouch (COBBOLD); a study has been made of the worm in tissues when killed by fixative.

From the detailed consideration of the changes observed in the uterine contents, the author concludes that there is a stage in which the uterine stems and the anterior branches are filled with outstretched embryos lying for the most part parallel to the uterine axis. When uterine peristalsis sets in, these embryonic forms are expelled and their place is taken by upsurging young developing from eggs. The appearances are those of a process of expulsive

emptying parturition, followed by uterine refilling from the ovaries. Pre-microfilarial young are commonly found free in the tissues of the host. This observation was originally used by Manson as the basis of his theory of lymph stasis. But in O'Connor's material these forms were commonly found in lymphatic glands, together with normal microfilariae. The evidence is that many young are born while still coiled within the egg membrane and that they may subsequently rupture and escape from it.

When the microfilariae are found in numbers in by-passing lymph capillaries or in lymph glands, their situation is such as would be caused by a process of expulsive emptying parturition. The main factor in ascertaining from microscopic sections the level to which parturition may empty the uterus is the observation that at any level all the contained microfilariae are at much the same stage of development; but do these synchronized emptying parturitions cause the rise of the microfilarial blood tide? This is answered by the following facts:—(1) The tides were present when the specimen was obtained, (2) blood obtained by skin-prick was found enough to establish periodicity, and (3) the parturition of the worm took place at an hour reasonably related to that at which the microfilarial blood tide rose. In lymph glands removed between 13.45 and 14.28 hours [1.45 and 2.28 p.m.], O'Connor found that the uterine stems of the inhabiting filariae were either empty or contained eggs only. In necropsy material, that obtained from persons dying about midnight was particularly helpful. Out of six autopsies in which these conditions were recorded, satisfactory findings were obtained in two only. Nevertheless the findings are stated to be such as would occur if synchronized parturitions expelled a swarm of microfilariae into the lymphstream at such a time as would cast them into the blood during the normal period of the microfilarial tide.

Whatever may be the mechanism underlying periodicity, some stimulus must surely attract the microfilariae into the skin blood at night. This synchronizing stimulus remains unknown. Possibly it may be through the male bringing about coitus and impregnation at a certain hour, or through the female by exciting parturition at a certain hour and thus leaving the uterus empty. The stimulus comes into being once in 24 hours, but produces a response in parasites only when they are ready for it. In the periodic Bancroftian filariasis all female adults are ready for it every night, but here again difficulty arises when stipulating what happens for the non-periodic form, for *A. perstans* and for *L. loa*. The author discusses at length the larvicidal mechanisms which interfere with the rise of the microfilarial tide. It is well known that microfilariae, though born, may not reach the blood. Reasons are given against the belief that embolisms of still-coiled embryos can effectively dam the lymph current through a lymphatic gland, but probably the microfilariae are held back, imprisoned and destroyed by active proliferation of the cells of the macrophage system. By these means the lymph current is slowed down and the microfilariae held where these cells are most numerous. The end result of these larvicidal mechanisms is to produce ever-increasing lymph stasis and such clinical results as hydrocele and elephantiasis. These effects arise from two interacting factors—excessive extracellular lymph protein, and fibroblastic activity. The fibrous formation that they induce round the lymphatic tract contracts and interferes with the further free flow of lymph through it.

There is an analogy between the effects of raised blood pressure and lymph pressure. Vessels become dilated and where they have muscular walls these are thinned or thickened. The earliest evidence traced for this dilatation goes back to Manson's observation of skin vesicles that, when ruptured or pricked, discharged microfilariae. The accompaniment of elephantiasis is presumably due to an increase of extracellular protein in the lymph, brought about by

lymphatic back-pressure as well as by disintegration of cells in the lymph. This is probably more important than the mechanical obstruction of lymphatic channels by living or dead adult filariae. This effect is discounted by observations on the disintegration of these parasites.

In filariasis lymph contains more red cells than normal and it contains also microfilariae and cells of the macrophage system which are in a state of dissolution—all these factors add to extracellular protein. If the rise of microfilarial blood tide is due to synchronized nightly births of microfilariae, how is the fact that these tides do not get higher night by night accounted for? It is assumed that each night an unknown mechanism releases only enough microfilariae to keep the level constant in spite of wastage. All microfilariae born each night are destroyed each day. This is shown by a study of O'Connor's sections which furnish proof of their massive destruction by the visceral part of the macrophage system. It must be confessed that here again the proof is not convincing. Killed or already dead forms were seen of which a number were identified in sections of the liver in three cases and in the spleen in two, in the adrenals in one. In the kidneys the microfilariae appeared undamaged. There is evidence of a larvicidal mechanism in the lungs. The material is derived from two cases. The larger number of sections show advanced destruction of some microfilariae in both. This destruction may also take place locally, and an aggregation of cells of the macrophage system apparently denotes the area in which microfilariae are being destroyed. The frequency of these pulmonary aggregations cannot be estimated. The conclusions were vitiated by the fact that the second case studied had a superadded schistosome infection.

The established natural microfilarial tide may fail when the young embryos have passed through the hazards in the lymph tract, and, when carried by the pulmonary artery to other hazards in the lungs, they are destroyed in the visceral part of the macrophage system. This is exhibited by the observation of Manson in a case of orchitis with fever in which a persistently lower microfilaria count ensued and in one case of KNOTT's in which death occurred from acute frontal sinusitis. Ninety minutes after death the lymph glands, spermatic cord and testis were removed. In the cord, recently defunct filariae of both sexes were found and the appearances suggested that they had died and had commenced to disintegrate during the host's life, their lack of enshroudment pointing to death at the time of high fever when the microfilariae disappeared from the blood, and none of them could be found in the tissues.

In the non-periodic form of *W. bancrofti*, similar happenings have been recorded by BAHR, but no observations were forthcoming on the state of pregnancy or parturition of the associated worms. Analogy with *D. immitis* (WRIGHT and UNDERWOOD, *Vet. Med.* 1934, v. 29, 6) would suggest that this is due to sterilization or death of the parent worms. Weighty considerations have led Lane to regard the non-periodic state as the primitive one, but it is not possible to review in full his argument as to how the non-periodic habit became confined to the Pacific area and the influence of the mosquito intermediary in maintaining it.

Under the heading "Tidal Mechanisms and Direct Diagnosis" the author discusses blood examination, qualitative or quantitative. Such a blood examination does not exclude infection, for a negative result may give place to a positive one by the use of enrichment methods.

Even then there is a note of despair—there is no hope with our present knowledge of making a quantitative diagnosis—such as estimating the *worm load* by making microfilarial counts.

Finally the mechanisms of host and parasite in their bearing on anthelmintic treatment are passed in review. There is at present very little solid basis for speculation.

Surgical excision of worms holds little prospect of " unworming " the patient. Drugs have so far not been given by the lymphatic route, which, if it is possible, holds out the best hope. Controlled X-ray irradiation has given some promising results. Treatment by inducing hyperimmunity and by lessening the harm the microfilariae bring about is worthy of consideration.

[Much thought and infinite zeal must have been devoted to the compilation of a paper which, while replete with sectional summaries, occupies some 67 pages of the *Transactions* and which is illustrated by no less than 58 beautifully executed photomicrographs.

The following observations are added by the reviewer as a contribution to the subjects of (1) the flow of lymph after death and (2) the numbers of circulating microfilariae :—

There is a postmortem flow of lymph which is recognized, but it is purely an agonal event in contrast to the smooth and even flow during life. The postmortem flow of lymph is stated to last from ½–1 hour after death (in dogs). It comes on after hydraemic plethora and mostly from the liver and is the result of lymph which is formed previous to death being squeezed through the thoracic duct by intestinal movements. It may also be due to the increased permeability of the capillaries owing to excessive filtration of lymph under normal or subnormal pressure. After death the capillary pressure in the liver is much higher than normal in animals. There is therefore a local flow of lymph, but nothing which could affect the localization of masses of microfilariae—as for instance their transference to the capillaries of the lung.

As regards the number of microfilariae in the circulation, the reviewer has ascertained from one of his own specimens in which the one uterine branch of *W. bancrofti* is stained, with contained embryos, that each millimetre of fecund uterus contains 200. Taking the average length of the female filaria as 65 mm., each branch of the uterus would measure 63·5 mm., allowing for the fact that only one half contains fully formed embryos, the other premicrofilarial young or ova. This would give a total daily production of 12,700 embryos. As to the maximum number of fecund parturient filariae we really have no idea, but Lane's figures (p. 725) suggest that there may be as many as 80 adult filariae in the body. Many of these were defunct or calcified and a considerable proportion must have been males. If one allows 40 fecund females (a generous allowance) to be capable of maintaining 4,000,000 embryos in the peripheral circulation, this would postulate individual production of 100,000 embryos every 24 hours, a figure which is 8 times as large as the 12,700 referred to above. If one admitted in the former instance that the filariae were capable of producing embryos for one year, the stupendous figure of 36,500,000 would be obtained.] *P. Manson-Bahr*

MURRAY, W. D. **Filariasis Studies in American Samoa.** *U.S. Nav. Med. Bull.* 1948, Mar.–Apr., v. 48, No. 2, 327–41, 5 figs. [15 refs.]

Filariasis and elephantiasis surveys of American Samoa were made preliminary to control measures. The data were analysed according to villages, age, and sex, for both filariasis and elephantiasis ; the cross relationship was also considered [the filariasis survey was of microfilariae in the blood, which has been described as " micro-filariasis "].

Thick film smears were stained with Giemsa's stain. " Accurate, pipette measurements of the blood smears were not made," nor apparently were any specified numbers of slides examined per person. It was concluded that the percentage of persons infected did not give an accurate indication of the filariasis situation, and, therefore, " worm counts " per slide were made and the average counts per positive slides and per total slides were calculated.

Of a total of 5,144 slides, 982 (or 19·1 per cent.) were positive. Where more than 100 slides were examined in a village, the incidence varied from 13·2 to 25·6 per cent.

The blood of children under 5 years of age was not examined. In the succeeding quinquennial periods, the incidence of positive slides rose regularly from 5·2 per cent. (age 5–9) to 43 per cent. (age 50–54) and then irregularly up to 50 per cent. (age 75–100). The average number of " worms " per slide showed a steady rise up to the 50–54 age group (30·7) but after this tended to fall and was 11·1 in the highest age group.

The rate for microfilariae among men was almost double that of women in all age groups above the age of 20 years.

Elephantiasis was not observed in any person less than 30 years of age. Of 1,575 persons over the age of 30 years from whom blood slides were taken, 66 (or 4·2 per cent.) showed elephantiasis. " If hidden parts such as the scrotum had been examined, the rate would have been considerably higher." Of these, 51 (5·8 per cent.) were men and 15 (2·1 per cent.) women. The incidence was correlated with the age.

Of the 66 persons with elephantiasis, 32 (48·5 per cent.) showed microfilariae in the peripheral blood. The microfilaria rate for a total of 1,573 persons of 30 years or over was only 36·6 per cent. The author concluded that " Samoans with elephantiasis had a considerably higher rate of microfilaremia than did Samoans without elephantiasis, when comparable age and sex groups were considered."

[The author discusses the results and draws his conclusions as if his figures had been obtained on a strictly quantitative basis, whereas the technique adopted would only allow of qualitative results ; *e.g.* the amount of blood taken was not measured, but it is stated that it *approximated* 20 cubic millimetres.] *L. E. Napier*

WHARTON, D. R. A., CUERVO, C. & MOYER, A. W. **Skin Reactions in Sensitized, Infected and Normal Rabbits with Filarial and other Nematode Antigens.** *J. Infect. Dis.* 1947, Nov.–Dec., v. 81, No. 3, 254–60. [15 refs.]

" Rabbits were sensitized with saline extracts of *Ascaris* and the filarial worms, *Dirofilaria immitis* and *Litomosoides carinii*, and by infection with *Trichinella spiralis*. When these rabbits were tested intracutaneously, the different antigens reacted specifically, and there was no significant reaction with filaria antigen in the *Ascaris* sensitized rabbits.

" However, in the trichinous rabbits all the antigens reacted strongly, although *Trichinella* antigen was negative in the heterologously sensitized rabbits.

" There was evidence of reaction by *Ascaris* in a few of the non-*Ascaris*-sensitized animals. This may have been due to specific sensitization by obscure ascarid infections. . . .

" It is concluded that in skin tests for filariasis, cross reactions with intestinal helminths such as *Ascaris* do not ordinarily occur."

SCOTT, J. A. **Studies on the Transmission of the Filarial Worms of the Cotton Rat.** *Amer. J. Trop. Med.* 1948, May, v. 28, No. 3, 481–5.

" A method is described for infecting groups of cotton rats with relatively constant numbers of the filarial worms, *Litomosoides carinii*, all of which are of the same age. The infections were produced by exposing the rats in metal tanks to counted numbers of mites whose percentage of infection had been

determined. Such rats are superior for chemotherapeutic studies and for studies on immunity to wild caught rats with infections of various numbers of worms of mixed ages. Further improvement along this line is needed, however, and to indicate possible lines of procedure the factors in the variability observed in these experiments are analyzed."

PEEL, E. & CHARDOME, M. Note complémentaire sur des filaridés de chimpanzés *Pan paniscus* et *Pan satyrus* au Congo Belge. [**An Additional Note on the Filarial Worms of the Chimpanzees,** *Pan paniscus* **and** *Pan satyrus*.] *Ann. Soc. Belge de Méd. Trop.* 1947, June 30, v. 27, No. 2, 241–50, 8 pls.

The previous discovery by PEEL & CHARDOME [this *Bulletin*, 1947, v. 44, 339] of the adult female *Dipetalonema streptocerca* in chimpanzees, is now amplified by a description of the male adult. In addition they have found and identified the adult forms of *Mf. rodhaini* Peel & Chardome, 1946, and assign them also to the genus *Dipetalonema*.

Three male *D. streptocerca* were collected from the subcutaneous connective tissue of two chimpanzees, *Pan troglodytes schweinfurthi*. They measured 17·5 to 18·1 mm. long with a maximum diameter of 46·66μ. There are three pairs of pre-anal and two pairs of post-anal papillae and a sixth pair 26·66μ from the caudal extremity, which is described as terminating in two cuticular prolongations. [This description is incompatible with the figures illustrating the ventral and lateral views of the male tail. The two figures are also incompatible with each other.] The unequal spicules average 338·8μ and 117·4μ long respectively, and there is a small gubernaculum.

Three female and one male *D. rodhaini* were collected from the subcutaneous connective tissue of *Pan troglodytes schweinfurthi*. The male is 19·9 mm. long with a maximum width of 53·32μ. There are two pairs of pre-anal and two pairs of post-anal papillae, and a single pair situated 6·66μ distant from the latter. The diameter of the single pair of papillae is twice that of the anal papillae. [This makes a total of five pairs of papillae; but in the drawing there appears to be a *sixth* pair between these and the tip of the tail.] The unequal spicules are respectively 366·63μ and 143·31μ long. The average length of the female worms is 25·216 mm. and the maximum width 83·3 to 86·6μ. The genital opening averages 502·15μ from the anterior extremity.

J. J. C. Buckley

VARGAS, L. Los simulidos en la transmisión de la Oncocerciasis Americana. [**Simulium and the Transmission of American Onchocerciasis.**] *Medicina.* Mexico. 1948, May 10, v. 28, No. 555, 177–90. [66 refs.]

A general account, with bibliography.

GAYTON, J. L., BELLIS, M. & MCCLENANAN, W. H. **A Survey of Pinworm Infection in an Elementary School.** *Canadian J. Pub. Health.* 1948, May, v. 39, No. 5, 200–202.

The public health nurse in an area in South Vancouver received repeated reports from mothers concerning minor symptoms in their children attributed to pinworms (*Enterobius vermicularis*). The authors therefore examined 145 of the 160 children in the local village elementary school. Examination was made by means of the Graham swab (three inches of "Scotch tape," held sticky side outwards over the end of an applicator). The swab was then dipped in dilute iodine solution and applied to a microscopic slide for examination.

The results are shown in four tables. Altogether, 38 children were found positive and 21 others were "known positive," in that pinworms had been seen by the parents. Twelve in the latter group were not examined for ova. Thus 59 (37·6 per cent.) of 157 children were positive.

There were 116 families represented in the school and 46 of them were shown to have pinworm infection in the family. The median length of residence of these families in the district was only two years. Positive cases were found in every type of family. Infection was highest in the younger children: there were 50 per cent. positives in school grades II and III and only 21 per cent. in grades V and VI. The geographical distribution of cases was comparable to that of the general school population.

After the examination, the public health nurse visited each of the 46 "positive" families. Symptoms attributed by the parents to pinworm varied from convulsions and coma in one small child to abdominal cramps, nausea, restlessness, poor sleep, anorexia and underweight. In an adult, simple pruritus ani was the only symptom.

Many of the children had been treated previously, so that either the treatment generally used was ineffective or reinfection occurred. The treatment recommended was gentian violet enteric-coated tablets thrice daily in standard dosage in two 8-day series one week apart. The whole family was usually treated, with few complaints of nausea or diarrhoea. Quassia enemas and ammoniated mercury ointment were also used. Underwear and bedding were boiled.

The authors observe that "reports in recent journals" would suggest that their findings were not unusual and that the percentage of 37·6 found by them would probably indicate a true incidence of some 50 per cent. positives. *Enterobius* infection as a public health problem requires further study.

H. J. O'D. Burke-Gaffney

HAEMATOLOGY

STEPHEN, J. D. **Haemoglobin and Plasma-Protein Levels in West Africa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1948, May, v. 41, No. 6, 829–31.

Because of the prevalence of dietary deficiencies and anaemias in West Africa, the author, in the Gold Coast, compared the haemoglobin and plasma-protein levels of troops of the Royal West African Frontier Force with those of the civilian population to determine whether army rations had any effect in increasing haemoglobin values.

Seven groups of 50 persons each were studied namely (1) African recruits with 6 weeks' service, (2) African soldiers with 6 to 8 months' service, (3) African soldiers with 2 or more years' service, who had been in India, had been on a European-scale ration and, in many cases, had taken suppressive mepacrine, (4) African male civilians from coastal villages, (5) African children from coastal villages, (6) pregnant African women, (7) European soldiers stationed in Accra for 3 to 18 months.

The tests were made on 5 cc. quantities of oxalated blood (6 mgm. ammonium oxalate mixed with 4 mgm. of potassium oxalate). The specific gravity of the whole blood and of the plasma was determined by the copper sulphate method of PHILLIPS *et al.* (*Copper Sulphate Method for measuring Specific Gravities of Whole Blood and Plasma.* 1943. New York: Josiah Macy, Junior Foundation) and the haemoglobin and plasma-protein levels were read from a simple line chart.

The results are shown in two tables. The African haemoglobin levels generally were lower than the European, but a high level was found in the soldiers of group (3), as might be expected, in view of their diet and freedom from malaria in most cases. Their mean haemoglobin in gm./100 cc. was 15·1 compared with 15·4 for group (7), the European soldiers, and 14·2 for the soldiers in group (2) and the male villagers in group (4). The levels in pregnant women and in children were 11·4 and 12·2 respectively; the frequency of macrocytic anaemia in the pregnant women and of malaria in the children would lead one to expect such figures.

There were no significant variations between the plasma-protein levels in the Africans and in the Europeans.

Since the highest African haemoglobin level was found in the troops who had had a European-scale ration and, in many cases, suppressive mepacrine, the author concludes that "it is thus possible to effect a rise in the African haemoglobin level so that it equals that of the European."

H. J. O'D. Burke-Gaffney

DEWHURST, K. E. **The Normal Lobular Neutrophil Picture in the East African.** *J. Trop. Med. & Hyg.* 1948, June, v. 51, No. 6, 128–30.

The author discusses the principles and significance of the Arneth count and the polynuclear count of Cooke and Ponder and also discusses the findings of a number of workers in the Tropics who found a "shift to the left," both in health and disease [this *Bulletin*, 1937, v. 34, 259; 1942, v. 39, 54]. He notes that KENNEDY and MACKAY [*loc. cit.*, 1937] attributed a normal "shift" to climatic conditions, as in the case of Europeans the Cooke-Ponder weighted mean became normal on their return to Europe. In health a lower weighted mean than 2·75 or a higher Arneth index than 58·5 indicates a "shift to the left."

The present author examined blood films from 500 healthy East Africans: 330 were examined in Kenya and 170 in South-East Asia Command. Four tribes were included, but tribal variations in results were negligible.

The Arneth index and the weighted mean were found respectively to be 73 and 2·4, indicating a "left shift" in these Africans compared with the European standards quoted above. In the case of the Africans, the author took the normal limit of the Arneth index to be 65, which is the extreme limit in the European range (given as 51 to 65), and on this basis estimated that 82 per cent. of the blood films examined showed a "left shift," which was significant (above 70) in 65 per cent. The figures are shown in tables in the text.

It is suggested that, in addition to the effect of drugs or toxic absorption, an increase of immature neutrophiles in the peripheral blood may be stimulated by climatic conditions. The author considers that this is due not to exposure to ultra-violet light, but to the thermal effect of a tropical climate. It is noted that such a shift was found in places with a high humidity (Calcutta) where the effect of ultra-violet rays is diminished owing to their high absorption.

The results show in general that most of the Africans examined showed a "shift to the left" owing to a marked increase of cells of Class II

[The present reviewer studied the Cooke-Ponder polynuclear in health and disease in East Africans in 1931 (this *Bulletin*, 1931, v. 28, 837). He also found some "shift to the left" in a control group which were taken to be healthy Africans: but to find the "normal" African, the most careful clinical examination was required in order to exclude any possible factor which might influence the blood counts. In the present author's case, the men examined would of course constitute a much more reliable "healthy" group, since they were controlled troops under constant medical care. The author's suggestion

that the " left shift " might be due to the thermal effect of a tropical climate is interesting, but would require more concrete evidence in its support.]

H. J. O'D. Burke-Gaffney

WILKINSON, J. F. **Folic Acid.** *Brit. Med. J.* 1948, Apr. 24 & May 1, 771–6; 822–7, 2 figs. [101 refs.]

VENOMS AND ANTIVENENES

TRETHEWIE, E. R. & DAY, A. J. **New Therapy of Ophidiasis.** *Australian J. Exper. Biol. & Med. Sci.* 1948, Mar., v. 26, Pt. 2, 153–61, 5 figs. [17 refs.]

" It was found that neo-antergan injected subcutaneously into mice after the previous injection of *Pseudechis porphyriacus* venom subcutaneously did not reduce mortality.

" Neo-antergan when injected with heparin into mice reduced the mortality following the injection of venom from 50 to 5 p.c.

" A rise of pulmonary arterial pressure was detected in the cat following the injection of this venom but this rise was not affected by previous treatment with neo-antergan.

" The significance of these findings and the rôle of this form of treatment has been discussed."

SERGENT, Et. Sur le venin des scorpions *Prionurus australis* L. et *Prionurus aeneas* C. Koch. [**On the Venoms of** *Prionurus australis* **and** *Prionurus aeneas*.] *Arch. Inst. Pasteur d'Algérie.* 1948, Mar., v. 26, No. 1, 21–4, 1 fig.

The author has found, by repeated experiments, that the venom of *P. australis* is more potent than that of any of the other North African scorpions. The fatal dose for white mice, 20 gm. weight, is 1/40–1/20 telson, the higher dose causing certain death in 2 hours. In previous studies, Professor Sergent has compared this with another scorpion which he called *P. liouvillei*, whose venom is less than one-sixth as toxic, 1/3 telson being the m.l.d. for these mice. He now finds that what he has been calling *P. liouvillei* is in reality *P. aeneas*. He gives descriptions of both these, indicating the differences. In a list he gives the lethal doses of the 7 common species of scorpions in North Africa and incidentally shows that the common belief that the black scorpions are the most dangerous is erroneous; the third, fourth and sixth in the following list are black. The m.l.d. is of the dried powdered telson. *Prionurus australis* 1/20th telson; *P. amoreuxi* 1/15th; *P. hoggarensis* 1/12th; *P. aeneas* 1/3rd; *Buthus occitanus* 1/2; *Hottentota gentili* 3/4–1; *Scorpio maurus*, 7 telsons.

H. Harold Scott

VACHON, M. Études sur les scorpions. [**A Study on Scorpions.**] *Arch. Inst. Pasteur d'Algérie.* 1948, Mar., v. 26, No. 1, 25–90, 86 figs.

A comprehensive zoological study.

ERRATUM

In the abstract of the paper by MARQVARD, this *Bulletin*, 1948, v. 45, 540–41, the words " it was found that the lysocithin formed by the lecithase in the

blood suspensions were stabilized. It is believed that venom is the stabilizing substance" should read " it was found that blood suspensions were stabilized. It is believed that the lysocithin formed by the lecithase in the venom is the stabilizing substance."

DERMATOLOGY AND FUNGUS DISEASES

CALERO, C. **Chromoblastomycosis in Panama. Report of a New Case and a New Clinical Form.** *Arch. Dermat. & Syph.* 1948, Feb., v. 57, No. 2, 266–71, 4 figs.

The author describes an unusual clinical form of chromoblastomycosis in Panama, in which the lesions were not confined to a single area of the skin. The earliest lesion appeared on the antero-external aspect of the left leg as a small nodule which slowly spread until it attained a diameter of 16 cm. It was verrucose but not markedly hypertrophic, it bled easily from slight trauma and it was surrounded by a number of satellite nodules. A second lesion developed on the back of the right middle finger. It measured 5×6 cm. and was covered by white, greasy scales, the removal of which caused slight bleeding and exposed a smooth, glistening surface, more eczematoid than psoriasiform in appearance. Scrapings from both lesions showed the characteristic pigmented fungal cells of the disease, and *Fonsecaea pedrosoi* var. *communis* was isolated from these in culture. A third type of lesion developed later as a well-demarcated infiltration of the skin, without scaling, excoriation, vesiculation or formation of verrucae, on the neck and the flexures of the extremities. The fungus was not found in this kind of lesion and it was believed to be an allergic manifestation of the disease. *J. T. Duncan*

WEED, L. A. & PARKHILL, Edith M. **The Diagnosis of Histoplasmosis in Ulcerative Disease of the Mouth and Pharynx.** *Amer. J. Clin. Path.* 1948, Feb., v. 18, No. 2, 130–40, 4 figs. [65 refs.]

In histoplasmosis, a disease of protean symptomatology, the diagnosis rests inevitably on the discovery of *Histoplasma capsulatum* in the lesion, by microscopy or by culture, and therefore, accessible lesions such as the ulcerating granulomata which sometimes occur in the mouth are of particular importance for diagnosis. The authors describe lesions of this kind in four cases of generalized histoplasmosis. In one case, they took the form of ulcers measuring 1 cm. in diameter, with heaped-up edges, on the faucial pillars and epiglottis; in another, there were multiple small punched-out ulcers near the tip of the tongue which prevented its protrusion because of the pain they caused; in the third case, patches of hypertrophied mucous membrane containing small red nodules simulated epithelioma, but the underlying granuloma was characteristic of histoplasmosis; and in the fourth, in addition to granulomatous lesions on the soft palate and neighbouring areas, a large ulcer involved almost the entire floor of the mouth and a smaller ulcer was found on the epiglottis. In this last case, seven different diagnoses, which did not include histoplasmosis, had been made.

In all four cases, the diagnosis of histoplasmosis was based on the isolation of *H. capsulatum* in culture from the mouth lesions, but histological confirmation was definite in one case only, uncertain in two and wanting in the fourth. *J. T. Duncan*

SMITH, D. T. & HARRELL, E. R., Jr. **Fatal Coccidioidomycosis. A Case of a Laboratory Infection.** *Amer. Rev. Tuberculosis.* 1948, Apr., v. 57, No. 4, 368–74, 4 figs.

"The arthrospores of the cultural form of *Coccidioides immitis* are highly infectious. A number of laboratory epidemics have occurred, generally resulting in subclinical, but occasionally clinical, infections. A small epidemic in our laboratory resulted in 5 subclinical infections and one progressive, fatal case of coccidioidomycosis. This fatal case is reported in detail.

"The organism can be studied without danger of infection by classes in bacteriology and mycology if the cultures are dispensed in test tubes, not Petri dishes, and care is taken in opening the tubes and in keeping the powdery hyphae wet while transferring and studying the material."

STUDY, R. S. & MORGENSTERN, P. **Coexisting Pulmonary Coccidioidomycosis and Tuberculosis.** *New England J. of Med.* 1948, June 10, v. 238, No. 24, 837–8, 3 figs. [This summary appears also in *Bulletin of Hygiene.*]

"A case is presented in which coccidioidal cavitation was observed for fifteen months in a patient who subsequently developed a caseous cavitary tuberculosis in the opposite lung, with a positive sputum test for tubercle bacilli.

"That tuberculosis and coccidioidomycosis may both cause pulmonary cavitation is now a well known fact. Also, since the diseases may coexist in the same patient, it is advisable to check routinely for both tubercle bacilli and *Coccidioides immitis* in all patients with pulmonary cavitation."

MISCELLANEOUS DISEASES

DAVIES, J. N. P. **Pathology of Central African Natives. Mulago Hospital Post Mortem Studies, 6.** *East African Med. J.* 1948, Mar., v. 25, No. 3, 117–22. [15 refs.]

Beside facts of interest to all who are concerned with cancer, this paper contains matter which demands peculiar attention. First, the author points out that, although the relatively high proportion of sarcomas to carcinomas in Africans has received frequent comment, yet if the reticulo-endothelial tumours, including leukaemias, lymphosarcomas, etc., are placed by themselves in a separate class, the occurrence of sarcoma then no longer preponderates. Among the 143 examples of malignant disease examined, reticulo-endothelial tumours composed the remarkable percentage of 24·5—a matter which no doubt will elicit further inquiry.

Another new observation concerns cirrhosis and cancer of the pancreas. With the negroes of East Africa, as in those of the South and West of the continent, cirrhosis and cancer of the liver are specially frequent; among the 85 instances of carcinoma examined in Uganda, the liver was the site in 29. Cirrhosis and cancer of the pancreas also are common, the pancreas being the primary site of the disease in 11 of the 85 carcinomas. The author suggests that the lesions in the pancreas, like those in the liver, may have been caused by certain kinds of malnutrition. *Harold Burrows*

CLARK, M. **A Report of Fifty Consecutive Cases of Malignant Growths seen amongst the Wa-Kikuyu.** *East African Med. J.* 1948, Mar., v. 25, No. 3, 123–5.

This paper gives a brief account of fifty examples of cancer which had been examined consecutively in one hospital in Kenya. The patients all belonged to a single tribe—the Kikuyu. As in Davies's paper, mentioned above, the results cannot in any way be subjected to statistical analysis, for obvious reasons. The observations were made on individuals selected almost by chance from the general mass of cancer patients in the district, and their general significance is limited by this condition. Nevertheless certain numerical features at once arrest the reader's attention. For example, among the fifty cases, fourteen of the cancers arose in the skin, twelve being in the legs. There were only two examples of hepatic cancer and none affecting the pancreas. The author calls particular attention to the high proportion of non-epithelial growths, namely 19 of the 50 cases investigated, and also to the relatively high incidence of cutaneous melanoma and of Kaposi's sarcoma.

Harold Burrows

ENTOMOLOGY AND INSECTICIDES: GENERAL

COLAS-BELCOUR, J. & ABONNENC, E. Contribution à l'étude de *Phlebotomus* (*prophlebotomus*) *minutus* Rondani en France. [**Observations on** *Phlebotomus* (*prophlebotomus*) *minutus* **Rondani in France.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 3/4, 222–5.

RAGEAU, J. Observations sur les phlébotomes de la région de Poitiers. [**Observations on** *Phlebotomus* **in the Poitiers Region.**] *Bull. Soc. Path. Exot.* 1948, v. 41, Nos. 3/4, 217–22. [10 refs.]

KOHLS, G. M. *Haemaphysalis ratti*, **a New Species of Tick from Rats in New Guinea and** *Haemaphysalis krijgsmani*, **New Name for** *Haemaphysalis* **novae-guineae Krijgsman and Pomto, 1932, Pre-occupied.** *J. Parasitology.* 1948, Apr., v. 34, No. 2, 154–7, 2 figs.

KNIPLING, E. F., BUSHLAND, R. C., BABERS, F. H., CULPEPPER, G. H. & RAUN, E. S. **Evaluation of Selected Insecticides and Drugs as Chemotherapeutic Agents against External Bloodsucking Parasites.** *J. Parasitology.* 1948, Feb., v. 34, No. 1, 55–70. [13 refs.]

Certain organic chemicals, including several known to be effective contact insecticides, were administered orally and in other ways to rabbits to determine their effects on blood-sucking arthropods subsequently fed on the rabbits. These parasites included body lice (*Pediculus humanus*), yellow fever mosquito (*Aëdes aegypti*), ear mites (*Psoroptes equi* var. *cuniculi*) and the lone star tick (*Amblyomma americanum*).

Several of the insecticides (*gamma* BHC [benzene hexachloride], chlordane, chlorinated camphene, etc.) were fatal to lice and mosquitoes feeding on rabbits after the latter had ingested a dose of 300 mgm./kgm. At this rate, however, the insecticidal substances were dangerously toxic to the vertebrate host. *Gamma* BHC had toxic action on mites at dosages down to 50 mgm./kgm. The most promising results, however, were obtained with indandione compounds, especially 2-pivalyl-1,3-indandione, which was highly toxic to lice at doses down to 2·5 mgm./kgm., at which rate the compound was not appreciably toxic to the rabbits.

The action of compounds used as chemotherapeutic agents against blood-sucking ectoparasites is highly specific. Thus, 2-pivalyl-1,3 indandione is very effective with lice and relatively inactive against mosquitoes; whereas *gamma* BHC is much more effective with lice than with mosquitoes.

J. R. Busvine

ANDREWS, J. M. & SIMMONS, S. W. **Developments in the Use of the Newer Organic Insecticides of Public Health Importance.** *Amer. J. Pub. Health.* 1948, May, v. 38, No. 5, Pt. 1, 613–31. [134 refs.]

A general review.

See also p. 829. DETHIER, Vincent G. **Chemical Insect Attractants and Repellents.**

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS

CONGO BELGE. Fonds Reine Elisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge. Rapport sur l'Activité durant les années 1939 à 1945 [BRAUWERE, P.]. [**Report on the Work of the "Foréami" from 1939 to 1945.**] 222 pp., 4 maps (1 folding), 15 figs. on 8 pls. & 20 diagrams. 1947, Brussels: 112 Rue du Commerce.

The Foréami (abbreviated form of "*Fonds Reine Elisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge*") is unique among medical and sanitary services in tropical territories. Its purpose is to provide, and to maintain for long periods of time, in a limited and specially backward part of the Belgian Congo, a much more intensive and more costly level of medical care than could possibly be provided for the entire colony. It acts therefore as a spearhead of sanitary progress, which, the authorities hope, may gradually move on to new ground, while handing over to the less well-endowed general medical services those areas which have already been reclaimed. Its activities are expected at the same time to provide valuable lessons of ideal practice, as patterns which the general medical and sanitary service of the colony may strive to emulate.

The Foréami was founded in 1930, and is run on essentially autonomous lines, though in close association with the colony's general health services. Only the interest on capital funds is spent, the nucleus of the capital having been provided by 50 million francs voted by parliament, 100 million assigned by the Minister of Colonies, and 285,000 francs donated by Queen Elisabeth. To this are added donations and subscriptions by the general public. The area covered by the Foréami has changed gradually from year to year. It began in the District of Bas-Congo, but this zone reverted to the general Health Services of the colony in 1934, and activities are now confined within the Districts of Moyen-Congo, Lac Leopold II and Kwango, covering the needs of about 625,000 people.

Until the war, a Report was published annually [for 1938 and 1937 Reports, see this *Bulletin*, 1940, v. 37, 398, 522; 1939, v. 36, 408, 656]. The activities of 7 years, 1939–1945, are reported, with a wealth of statistical detail, in the present volume, under date of July, 1947.

The Report gives the impression that the Foréami's methods have a distinct bias towards what may loosely be described as medical rather than sanitary forms of relief—that is, such measures as the provision of hospitals, dispensaries, itinerant treatment-teams, etc., rather than the organizing of rural sanitation by way of mosquito control, bush clearing, attention to water supplies, propaganda, and the like.

Each touring team is in charge of a medical man, and was intended to be responsible for the welfare of 25,000–30,000 people, though the number had later to be increased to 40,000–50,000. The aim is to examine, and treat if necessary, every one of these persons once every six months. A four-year plan of intensified effort was launched in 1939, envisaging the employment of 18 European medical men, 20 European "*agents sanitaires*" and 430 African assistants. The full complement were in action by 1939, but the war naturally interfered with progress, and by 1945 only 10 medical men and 13 "*agents sanitaires*" were in the service.

Details are given, together with photographs, of newly built hospitals, dispensaries and houses. With regard to new roads the war, far from limiting this important development, actually favoured it, because of the military value of a suitable network of road communications.

So intensive and comprehensive have the Foréami's activities been that it is not easy to summarize this work adequately in any space less than is occupied by the original report. In the section on epidemic diseases notes are given for the situation year by year for each of 14 diseases or groups of diseases, such as bacillary dysentery, amoebic dysentery, smallpox, relapsing fever, cerebrospinal fever, etc. There was no frank epidemic of any kind, and there were only 311 deaths under the heading of epidemic diseases among a total of 143,073 deaths from all causes during the 7 years of the Report. There were 1,575,653 vaccinations and revaccinations for smallpox during the period.

Under the heading of endemic diseases, sleeping sickness has long been regarded as the most serious condition, outclassing even malaria in importance. Yaws is fairly prevalent, but is not an anxiety, being easily cured. More serious, but less frequent, is leprosy. There are active foci of pulmonary tuberculosis, very fatal for the African; and venereal disease is common, especially gonorrhoea, with an increasing incidence of syphilis.

When the Foréami began operations, sleeping sickness was a veritable scourge ("*un véritable fléau*"), but it has since been reduced to no more than "*une simple menace*", as a result of systematic and repeated examination and treatment of the population. All other control methods were rapidly found ineffective, mainly through lack of cooperation by the Africans themselves. In recent years, however, direct action against *Glossina* has been taken, especially by means of fly traps of the Harris type, but these efforts have met with little success. Increasing reliance has been placed on mass chemoprophylaxis, with pentamidine or propamidine replacing suramin (Bayer 205) for this purpose. Because of its activity in the nervous stages of the infection, tryparsamide remains the sovereign remedy for established cases, in spite of the increasing incidence of arsenic resistance. The most effective treatment for arsenic resistant cases is a combination of suramin and tartar emetic. Out of a total of 58,505 cases of all types treated by all methods since the start of this work, 86 per cent. have been cured. A striking epidemiological finding is that "the existence of an arsenic-resistant strain generally provokes a veritable epidemic flare-up, due probably to the considerable virulence of the trypanosome and its extreme transmissibility" (page 76). [This does not accord with VAN HOOF's views (this *Bulletin*, 1947, v. 44, 1048; also quoted by PELLISSIER, this *Bulletin*, 1947, v. 44, 975) on decreased transmissibility associated with arsenic-resistance.]

A considerable section of the report deals with the SADAMI (*Service Auxiliaire d'Assistance Médicale aux Indigènes*), the name given to the activities of individuals or organizations not dependent directly on the government, and which are mainly various religious missions.

Appendices deal with (1) a general survey of pathological conditions encountered in the Congo, by A. FAIN; (2) Chemoprophylaxis experiments with propamidine and suramin, by A. FAIN and DRUMEL; and (3) the "buaki

or kibengi syndrome" [see this *Bulletin*, 1939, v. 36, 912–13] by DRUMEL and G. GEUKENS.

In some future Report of the Foréami it would be extremely valuable if a careful comparison could be drawn between health conditions in the Foréami's zones of activity and similar, perhaps neighbouring, areas which have not had such preferential treatment. It would be worth while knowing whether the extra benefits derived are fully commensurate with the extra care and costs expended. *E. M. Lourie*

DEVORS, P. Le Touat, étude géographique et médicale. [**Geographical and Medical Description of Touat.**] *Arch. Inst. Pasteur d'Algérie.* 1947, Sept.–Dec., v. 25, Nos. 3/4, 223–74, 3 figs. (2 maps) and 6 pls.

In this monograph the author gives an interesting account of the geography, history, sociology and disease prevalence of Touat where he had spent two years as a medical officer. Touat consists of a group of oases in the central Sahara extending over 220 km. from north to south. The northern end lies to the south-west of Laghouat.

The population consists of Arabs and Negroes. Their mode of life, manners and customs are well described and some good photograph reproductions add to the interest of the story.

Diseases of the eye are almost universal. Trachoma and acute conjunctivitis are both widespread. Week's bacillus or Morax's diplobacillus are responsible for the conjunctivitis. Gonococcal conjunctivitis was not seen.

Malaria is endemic, but the endemicity is of low intensity. From time to time exceptional circumstances have caused epidemic malaria. Thus in 1945, the opening of a *foggara*, an underground water channel, a kilometre from Adrar, the capital, resulted in the formation of a marsh which provided good facilities for mosquito breeding; an epidemic of malaria followed which lasted from June to October. The spleen rates everywhere are very low. Of 77 positive blood smears examined, *P. falciparum* was found in 44, *P. vivax* in 20, *P. malariae* in 12, and a mixed infection in one. The only three mosquitoes that have been identified in Touat are *A. multicolor*, *A. sergenti* and *Theobaldia longiareolata*.

Louse-borne relapsing fever had never been seen in Touat till 1945. In 1946 there was a large outbreak. The author saw and treated 316 cases. Arabs and Negroes were alike affected; the case mortality rate was highest among the Negroes, who are less well fed. No case was seen in infants under two years of age. Untreated cases often succumbed. Jaundice was a common symptom.

In 1941 and the two following years there were outbreaks of typhus fever. Neither typhoid fever nor Malta fever occur. Only two cases of cerebrospinal fever have ever been diagnosed. Sporadic cases of diphtheria are seen from time to time. Tuberculosis is not very widespread. Smallpox once very prevalent is now rare, thanks to vaccination. Epidemics of chickenpox have occurred. A serious outbreak of measles occurred in 1945; nine of 74 observed cases terminated fatally. Scarlet fever has never been seen.

Venereal diseases are very widespread; syphilis, gonorrhoea and soft chancre are all common.

Organic diseases of the heart are rarely observed. Acute rheumatism was not seen. Bronchitis is a common malady. Dysenteric syndromes are prevalent in May, June and October, when flies are most prevalent. Clinically the cases resemble bacillary infections. Amoebic infections appear to be rare.

Famine oedema was common in 1944–45, and followed a series of deficient harvests. Some 70 per cent. of the population harbour *Ascaris*.

There are no poisonous snakes. Scorpions are frequent, but their stings very rarely cause death. *Norman White*

United Nations Department of Social Affairs Population Division. Lake Success, New York. **The Population of Western Samoa.** *Reports on the Population of Trust Territories No. 1.* 1948, Jan. 17, 61 mimeographed pp., 7 figs. [Refs. in footnotes.]

In a prefatory note it is explained that " This is the first of a series of reports on the population of Trust Territories, being prepared by the Population Division in the United Nations Department of Social Affairs. The purpose of the reports is to summarize existing knowledge regarding characteristics of the population, trends of population growth, and the relation of population to economic resources in each of the territories."

The particular interest of the islands which form Western Samoa lies in the fact that the population, of about seventy thousand, is one of the most rapidly growing populations in the world. An attempt is here made to gather together all known statistics relating to it and to discuss the factors which may have contributed to this rapid increase.

The writers have, the reviewer believes, been successful in collecting all the early estimates of population, starting with that which has been attributed to La Perouse (1787). These early estimates were made at irregular intervals over a period which ended in 1886, that is to say for almost exactly a century. The evidence seems to suggest that in that period the population occasionally rose above forty thousand or fell below thirty thousand, but that there was no general trend over the whole period. It seems clear that such diseases as influenza and whooping cough, which were probably introduced to a non-immune population by European shipping, produced serious epidemics and sudden reductions in the population. The report refers also to wars between different sections of the population : it is felt that hardly enough weight is given to the fact that in the nineteenth century wars had become much more deadly because the Samoans possessed weapons made of iron, and also firearms. There is little evidence that famine reduced the numbers of people.

The second period may be said to have started with German occupation of the islands in 1900. From then until 1914 a census was made on several occasions, and in 1905 regulations were brought in for the registration of births and deaths. Throughout the period of German occupancy and, indeed, up to 1920, one may say that the population appears to have increased rapidly but to have been reduced occasionally by major epidemics. Much the most serious of these is described in the following words :—" During the last three months of 1918 influenza struck with such violence that it not only wiped out all the gain of the preceding seven years but reduced the population to a level below that of 1911. The number of deaths reported in 1918 was over 8,400 or 7,000 more than the number of registered births. The loss amounted to nearly one-fifth of the whole population. This ranks as one of the most disastrous epidemics recorded anywhere in the world during the present century, so far as the proportion of deaths to the population is concerned. As a result, when the next census was taken in April 1921, it showed practically the same population as in 1906."

The authors call attention to the fact that throughout this second period (1900–1920) the population manifested a succession of sporadic increases interrupted by precipitous declines : this, as they say, is characteristic of a rather primitive population with a high birth rate subjected to periodic catastrophes.

The third period dates from 1920 when the League of Nations granted a Mandate to New Zealand. Since that date there has been no major epidemic and the general health of the population has been steadily improved. In each year the registered births have exceeded the deaths and the population has

nearly doubled in less than a quarter of a century, the average increase being 2·5 per cent. per annum. This average rate of increase is greater than that recorded for any other tropical area : for instance, the Philippine Islands, in which the rate of increase is well known to be very great, has had an average of 2·3 per cent. over a comparable period.

Other parts of this interesting document discuss the proportion of foreigners and people of mixed blood in the Samoan population : also birth and death rates, and immigration and emigration. One receives an impression that the text has been written at least in part by men familiar with the problems on the spot, and fully aware of the difficulty of accumulating vital statistics through village headmen literate only in a Polynesian tongue. It is noted also that the report gives due and expert emphasis to social conditions : for instance the section on the density and distribution of the people is closely related to that on the economic development of the country.

The final chapter discusses the probable future of the Samoan population, which will have reached about 150,000 by 1975 if the present rate of increase continues : that would give the very high density of 280 per square mile of cultivated land. Clearly then, there is an urgent need for the study of native economics and agriculture and for the improvement of agricultural methods so as to ensure that the increase of food will at least keep pace with the increase of population. The writers also enter an urgent plea for a more complete statistical study which would give facts of age, distribution, fertility, mortality in relation to social conditions and so forth. *P. A. Buxton*

MANSON-BAHR, P. **Scottish Pioneers in Tropical Medicine.** *Edinburgh Med. J.* 1948, Apr., v. 55, No. 4, 220–31.

An interesting series of biographical sketches of some of those who have attained to fame in tropical medicine after medical training in one or other of the Scottish centres of learning, Aberdeen, Edinburgh and Glasgow. Sir Philip starts with James Lind who lived through the greater part of the 18th century and is known mainly for his work on scurvy and the diseases of seamen. [There was another James Lind, contemporaneous with him, who also served in warm climates and is often confused with the former.] More than a score of eminent tropical pioneers in medicine are spoken of : Grainger and the dysenteries, Wright and yaws, Livingstone, Morehead, Cobbold the parasitologist, Pinkerton the first lecturer on tropical medicine at Edinburgh, Timothy Lewis and D. D. Cunningham, friends and colleagues and both Fellows of the Royal Society. Lewis has been called the Godfather, as Manson the Father of Tropical Medicine. So to more recent times, to men but lately with us and known to present-day Fellows of the Royal Society of Tropical Medicine and Hygiene, Cantlie, Leishman, Alcock, and, lastly, to those whom we fortunately meet in the flesh today, G. Carmichael Low, whose world-renowned experiences in the Roman Campagna are known to all ; Professor R. T. Leiper, a helminthologist of worldwide reputation for his work and discoveries on *Loa loa*, Guineaworm and schistosomiasis ; Sir Malcolm Watson, memorable for his work on malaria and species sanitation and the first Director of the Ross Institute.

The article fitly begins with a quotation from Longfellow's *Psalm of Life*, and, not so aptly, ends with a misquotation from the same poet's *Lay of St. Augustine*, " The heights by great men reached and kept ", the author being perhaps led away by the example of Scotland's national poet who rhymed " Loch Lomond " with " afore ye." *H. Harold Scott*

BOOK REVIEWS

SCHAPERA, I. [Professor of Social Anthropology, University of Cape Town]. **Migrant Labour and Tribal Life. A Study of Conditions in the Bechuanaland Protectorate.** pp. xi+248, 1 folding map. 1947. London: New York: Cape Town. Geoffrey Cumberlege, Oxford University Press. [18s.]

For the past seventy years or more, Africans of Bechuanaland have been leaving their homes and the influence of tribal life to work in the Union of South Africa, a very large proportion to be employed on the Kimberley or South-West African Diamond Fields or the mines of the Witwatersrand. Except in the tsetse-infested Okovango swamp area of the north-west, the scarcity of surface water is the chief single natural difficulty to be combated by the African cattleman and farmer of Bechuanaland; this scarcity is extreme in the 135,000 square miles of Kalhari Desert in the west and south-west. The small population of this desert area consists essentially of Bushmen with an admixture of Bantu blood; of Bantu stock the Tswana are the dominant group and form the ruling communities of all the principal tribes inhabiting the more fertile eastern districts along the boundaries of the Transvaal and Southern Rhodesia, amounting to some four-fifths of the total population of 260,000—with a density of 3·9 persons per square mile. Water shortage and primitive agricultural methods make life hard for the Bechuana and it is not surprising that men are readily attracted to industrial work with its regular wage, a migration which in 1943 amounted to 35 per cent. of male adults; one-third of these were enlisted in the military Pioneer Corps.

The economy of the Bechuanaland Protectorate must be seriously affected; tribal authorities complain that the welfare of the people is suffering, herding of cattle is difficult, farming is incomplete and inadequate; these effects are counterbalanced, at least partially, by cash income received from the migrants. In addition, ancient tribal institutions have been affected by the activities of a European administration, by missionaries and by traders. Observations have been recorded on the spread of disease, notably tuberculosis and syphilis introduced from industrial areas, on decay of tribal discipline, on laxity of sexual morals and on an apparent decline in the birth rate.

What of the effect on the migrant personally? Physical results will depend on his environment. On the mines he has to work hard, but in return is looked after in many ways: he receives, for example, a balanced diet and free and immediate medical attention with consequent improvement in physical condition; this is not sustained, unfortunately, when he returns home. In other occupations, especially where food and quarters are not provided, health is more likely to suffer than to improve, mainly because of an unbalanced diet and insanitary surroundings. The illiterate Bechuana is little affected mentally by his sojourn in the industrial areas and on return to his country slips back readily into his previous and traditional mode of life, with perhaps some resentment of tribal authority or discipline. The partly educated Tswana, on the other hand, may get a relatively good job away, and returns home with a broader outlook and is generally a more useful member of his tribe. Some remain away permanently and are "lost" to their tribe.

Though this book is of interest mainly to South Africans the material presented covers the impact of highly organized and rapidly progressive European industrial undertakings on the economically self-sufficient African inhabitants of a neighbouring territory over a period of sixty years. The objective detail of methods, causes and effects of migration makes most interesting reading and should prove valuable to those whose duty it is to watch the interests of the African in tropical Africa, and to the resident of

Britain who for political or business reasons is interested in the development of East and Central Africa. The final chapter deals with " some possible remedies ", bearing in mind that Bechuanaland is only one of many sources of African labour for South African and S. Rhodesian industry.

Detribalization is not inevitable, and every encouragement should be given to the maintenance of contact between migrant and home by improved organization at the site of industry, by contracts which permit of regular return home and by ease of transportation ; most important of all is the alleviation of the difficulties of life of the general population and the coincident encouragement of a larger proportion of males of the 20–40 age-group to remain in their home territories, by improvements in the administration involving education, health and welfare services and methods of agriculture and animal husbandry. Restriction by statute of the numbers of migrants is not recommended.

This book is the outcome of a request by the Bechuanaland Protectorate administration to the author to study the effects of labour migration on tribal life, and contains useful statistical information in eight appendices and forty-three tables. *R. Ford Tredre*

UNITED STATES PUBLIC HEALTH SERVICE AND TENNESSEE VALLEY AUTHORITY. **Malaria Control on Impounded Water.** pp. xiii+422, 215 figs. 1947. Washington, D.C., U.S. Government Printing Office.

The Tennessee Valley Scheme vaguely reminds most people of the New Deal and the development from a primitive to an advanced state of a large tract of land. To malariologists, it is one of the foremost examples of ambitious malaria control, in its way unique, and the Mecca to which they turn when they reach the United States. Vast water conservation, irrigation and hydroelectric works have been created in a potentially malarious country where the principal vector, *Anopheles quadrimaculatus*, chooses the edges of impounded waters as a preferential breeding place. The necessity for malaria control has been recognized from the start and it has been integrated in the engineering works as an essential part of the scheme. Success has been complete and by 1945, a potentially epidemic year, only 20 out of 15,338 blood films taken from inhabitants in 1943-1944 were positive [see this *Bulletin*, 1947, v. 44, 801].

For the first time the methods used are fully described in a book prepared under the direction of Dr. E. L. Bishop, and Mr. H. D. Hollis, and edited by Mr. C. I. Mansur. To some extent the title is inadequate, for it deals at length with the morphology, bionomics and ecology of the North American anophelines, the parasitology and epidemiology of malaria and the conduct of malaria surveys, as well as malaria control by all established methods except drug prophylaxis. It thus constitutes a complete textbook of malaria control under American conditions, whatever the ultimate origin of the vector might be.

The chief interest to the non-American reader lies in the first half of the book which deals with the management of impounded water, on which it constitutes an authoritative statement such as is not available elsewhere. There is a well illustrated and fully detailed account of every process in the prevention of mosquito breeding from the time of the first decision to create a reservoir, through its construction to the time of its routine operation.

When a reservoir is first projected detailed maps are prepared showing the probable extent of anopheline breeding around its perimeter ; any necessary changes in the original plan are then made, and a control scheme outlined for every foot of water edge. Usually the first step is clearing and drainage of the margin to give a sharp water edge, leaving no emerging terrestial vegetation n the area to be flooded, a clear stretch above the normal water line where the

flotsam carried by floods can be stranded without embarrassment to subsequent control, special provision for the stranding of débris in some areas, and no hollows likely to hold water above normal water line on the subsidence of floods. On formation of the dam, the main object is to keep clean shore lines, mainly by water level management and plant control. During the mosquito season a regular cycle of fluctuation in the water level is followed and discourages breeding both through its direct action on larvae and its indirect effect on the vegetation which is essential to them. The cycle varies with the type and function of the reservoir, some types being less discouraging than others, but in all cases it produces a marked reduction in breeding and in the need for

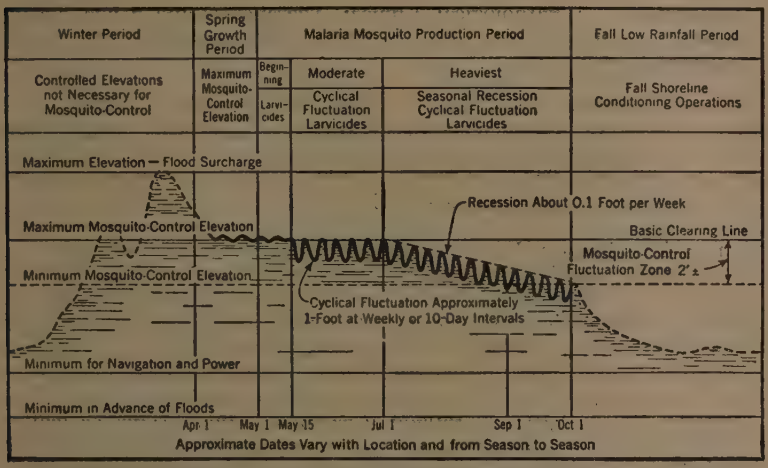


FIGURE 50.—Desirable phases of water level management for mosquito control on main-river reservoirs.

[Reproduced from "Malaria Control on Impounded Water."]

larvicides. Plant growth is modified by many methods, including, besides water-level-management, the use of selective hormone and conventional herbicides, the management of grazing, mechanical clearance and others which are fully described.

Where these measures are inadequate, larvicides are used, mainly DDT. Most are applied from aircraft, and the book gives a good account of air practice, but all varieties of mechanical, semi-mechanical and hand distribution are used from the shore and the water. As prevention of breeding may be temporarily either impossible or uneconomic, control measures extend to the mosquito proofing of houses and the application of indoor residual insecticides.

The book is well got-up and both freely and ably illustrated with sketches, plans and photographs, coloured where that is helpful to their interpretation; there is no phase of mosquito control which it does not cover in an able manner. Though written with the object of illustrating American technique and referring only to American anophelines it is a text book of malaria control which will be of great value wherever the English language is read. The reviewer's sole criticism is perhaps ungenerous as it is one of excessive modesty. The Tennessee

Valley Scheme is nowhere described as a whole entity. Though every method used on it is given in full one could end the book unaware of its scope, of the organization involved in a work of this magnitude, or of the relative importance of the different measures in the whole scheme. Even the few elementary facts at the start of this review have come from the reviewer's general knowledge and he still wonders what are the complications involved in treating 10,000 miles of shoreline. *G. Macdonald*

AMARAL, A. Dacio F., PONTES, J. Fernandes & PIRES, Carlos D. de Avila. **Amebíase. Estudo étio-patogênico, clínico, terapêutico e epidemiológico.** [Amoebiasis: A Pathological, Clinical, Therapeutic and Epidemiological Study.] 355 pp., 48 figs. 1947. S. Paulo: Tipografia Rossolillo, Rua Rui Barbosa N. 333.

This work originated in a study of Intestinal Amoebiasis in Brazil, to be followed by a report of more work on the medico-social problem of amoebiasis. The present volume is the outcome of a collaboration between the departments of parasitology and clinical medicine of the São Paulo University and the medical officers in charge of the penitentiary, and the gastro-enterological clinic of Santa Casa.

After an introductory chapter in general terms, there follows the first part dealing with the *parasitological aspect*, starting with the story of the discovery of amoebae in man, *E. gingivalis*, by GROS in Russia a century ago (1849) and *E. coli* by LEWIS and CUNNINGHAM in cholera stools in 1870–71, and of LÖSCH's amoeba in dysentery in Russia (1875), though Lösch did not recognize its pathogenicity; KOCH (1883–87) and KARTULIS in Egypt (1884). Next, is considered the pathogenicity or non-pathogenicity of various amoebae—*E. coli*, *E. histolytica*, *E. tetragena*, *E. minuta*, *Endolimax nana*, *Iodamoeba bütschlii*, etc.—and there follows a long discussion on nomenclature and an account of the morphology and biology, with good illustrations and graphs to indicate the sizes of the cyst forms. A subsection of this part is concerned with the action of the amoeba on man, with a setting out of the different views regarding its pathogenicity and the results of animal inoculation, bearing in mind that some laboratory animals may be naturally infected by amoebae. The statements in this chapter, as indeed throughout the work, are well documented and authenticated by quotations in the original.

Part II considers the *pathological anatomy*, with very fine reproductions of the lesions in various regions of the intestine, large, small and appendix, and the presence of granulomata (amoebomata); also in the liver, infection being brought there by the blood stream, by the lymphatics (not admitted by some writers), by the peritoneum, and by direct extension; in the lung by continuity and by embolism; and in the brain.

In Part III the *clinical aspect* is presented, with a discussion of the various classifications which have been put forward by CRAIG, MUSGRAVE, BOCKUS, and PRADO and FIGLIOLINI, and the authors give yet another of their own, dividing cases into two main groups: Primary or intestinal, and Secondary, in liver, lung, brain and elsewhere. The primary they sub-divide into (1) Mild, with few and slight symptoms—an epidemiological danger. (2) Constipating. (3) Diarrhoeic. (4) Mixed. (5) The right iliac fossa syndrome (? appendicular syndrome, or localization at the end of the ileum, at the ileo-caecal valve, or beginning of the caecum). Of each of these five forms clinical cases are detailed. (6) Neoplastic. (7) Toxic. The relative frequency of individual symptoms is related and cases are detailed, one with sigmoidoscopic appearances, one without;

others passing cysts but presenting no other symptoms. They quote Craig as saying that constipation is a frequent symptom in carriers, in fact, the rule rather than the exception, and cases are quoted in support of this. In this section also observations and comments are made on hepatic and pulmonary amoebiasis.

Part IV, *Diagnosis*, takes up the methods in turn. Direct examination, culture, animal inoculation ; sigmoidoscopy, with records of cases ; complement fixation with an aqueous extract of faeces or of pus from a liver abscess in an experimental kitten, or Craig's alcoholic antigen, or Stone's cyst antigen ; the intradermo-reaction with mucus and fragments of intestine in saline from a case of acute dysentery ; by radiology revealing local spasm. A table is given, adapted from Craig and Faust, for distinguishing the cysts, in Lugol's iodine or stained by iron haematoxylin ; another table from the same authors gives the distinguishing features of the six amoebae mentioned above, stained and unstained. The authors record that in examination of 2,727 samples of faeces 220 were positive, the numbers at successive examinations being 115 (52·2 per cent.), 41 (18·6), 29 (13·1), 16 (7·2), 15 (6·8) and 4 (1·8).

Part V, on *Treatment*, begins with a general survey of the indications and then speaks in more detail of (1) Alkaloids—kurchi, cinchona, *Chaparro amargosa*, and ipecacuanha derivatives. (2) Quinoline derivatives—yatren, vioform, diodoquin. (3) Arsenicals : trivalent (606 or sanluol, and 914, neosalvarsan) and pentavalent (treparsol, stovarsol, carbarsone). (4) Others—liver, liver extracts, cod liver oil, E.B.I., adrenaline, bismuth salts, etc. Lastly dietetic treatment. The authors give the views of others and then their own, stating that they place most reliance on emetine, but stressing that to be successful it must be given early, intensively, intermittently and periodically.

The sixth and final part considers *epidemiology and prophylaxis*. A map on a very reduced scale, but nevertheless fairly clear, of North and Central America shows the districts affected and there is a table quoting the incidence figures in the eastern hemisphere as recorded by various authors. There is another map of South America and a table giving various records of the names of investigators, the number of examinations carried out by them and the number found positive, in Canada, different parts of the U.S.A., South America and the West Indian Islands. Another map, on a rather larger scale, indicates the parts of Brazil where investigations on prevalence have been carried out and the results recorded by observers in the different States are quoted. Thus, in São Paulo alone 35 records are quoted in which the numbers examined ranged between 18 and 5,429 and the percentages positive between 0·1 and 50·39. Though detailed, these figures are not very informative. For example, one figure of 38·8 per cent. positive is based on examination of only 18 apparently healthy persons and the 50·39 on 127 believed to be healthy. The highest number examined, 5,429, were of specimens sent to the laboratory in the Capital District as long ago as 1917, and among these only 10 per cent. were positive. The question of age incidence is referred to, but here again little can be learned, because the records are based on very few cases and in limited localities. Nothing new is said on the mode of conveyance or on prophylaxis and both are dealt with in a few pages.

To sum up : The information in this book is well set out, interestingly expressed and clearly printed. To have accomplished such a task of collating information and assimilating to it their own investigations must have demanded wide research and it is most useful to have all these facts brought together in a single volume. The sections are well balanced, none being given disproportionate space, the clinical cases detailed, though few, have been carefully selected—they might be increased with advantage. References number nearly 300 from more than 250 authors from all over the world. Full credit has been given to other

workers in this field. In short, this is a book which should certainly be at hand for reference by anyone interested in the subject of amoebiasis.

H. Harold Scott

VAN THIEL, P. H. [Professor of Parasitology of the University and the Institute of Tropical Medicine at Levden.] **The Leptospiroses.** pp. x+231, 19 figs. on 8 pls. & 5 text figs. 1948. Leiden : Universitaire pers Leiden. [f.16.50.] [Review appears also in *Bulletin of Hygiene.*]

This book is a useful addition to the literature on leptospirosis. It should prove of value both as a work of reference and as a guide to those who have to undertake epidemiological investigations in the field. The clinical side of the various leptospiroses is less adequately covered. The full report of work done in Holland and Indonesia is especially welcome, because much of it was not readily available to English readers.

After a chapter on the morphology of leptospirae, the unitary and pluralistic views on the species problem are discussed. On the epidemiological and experimental evidence the author accepts Schüffner's classification :—Special " types " are ranked as species if more or less sharply defined differences exist in (1) antigenic structure ; (2) epidemiological behaviour with respect to carrier-hosts ; (3) behaviour in experimental animals ; (4) geographical distribution ; (5) clinical characters of disease produced in man. This outlook has practical advantages. If serum treatment is employed the specific serum must be administered. This would be impossible if the diagnoses were merely " leptospirosis." Preventive measures too may vary according to the carrier-host.

The third chapter contains full details of the laboratory methods employed in the isolation, culture and serological identification of leptospirae. Criticisms are made of the different methods, and suggestions given as to the appropriate occasions for their use. This chapter is particularly valuable. The information it contains was scattered throughout the literature in a number of languages, and has never before been brought together.

Epidemiology is the subject of the next chapter. Infection by direct contact with urine containing leptospirae is not common, except perhaps in the case of *L. canicola.* Attention is therefore directed mainly to the means by which water is contaminated by carriers, to the conditions necessary for the survival of the organisms, and to the most likely methods of infection in man. Techniques are described for isolating in guineapigs leptospirae from suspected water.

Prophylaxis is considered shortly under : (1) Destruction of leptospirae, by drainage of swamps or altering the acidity of waters—seldom practicable, though the use of calcium cyanamide as a fertilizer proved effective in the rice-fields in Japan. (2) Destruction of carriers, and " proofing " of buildings and swimming pools against rats. (3) Protection of persons at risk by the wearing of rubber boots and gloves, or by prophylactic vaccination.

Chapters on the pathological and biochemical changes, and on the symptomatology in man complete the general part of the book. This method of presentation was doubtless used to avoid repetition later. It may be the best possible, but the result is not very felicitous. The manifestations of leptospirosis are so diverse, and the benign forms differ so widely from the icteric varieties that the reader is left without any clear clinical pictures.

In the second half, each leptospirosis is considered individually, special attention being given to epidemiology and experimental findings in animals.

The symptoms of the diseases in man receive relatively little notice, but the other aspects are very well treated.

The book is well written and produced, but lacks a subject index.

J. C. Broom

LEMIERRE, A. *et al.* [Edited by]. **Traité de médecine, Vol. 2. Maladies infectieuses (seconde partie). Maladies parasitaires.** [Treatise of Medicine. Vol. 2. Infections and Parasitic Diseases.] 955 pp., numerous figs. 1948. Paris: Masson et Cie, 120 Boulevard Saint-Germain. [1,950 *fr.*; £2. 10*s.* 0*d.*]

The second volume of this Treatise of Medicine, which is a very considerable work of seventeen volumes, deals partly with infectious diseases [most of which occupied the first volume] and largely with parasitic diseases. About 700 of its some 1,000 pages deal with diseases due to parasites and fungi and those caused by bacteria or viruses which might properly be called tropical diseases. These are dealt with systematically and, in the case of some of the more important diseases, at considerable length. Historical, geographical, epidemiological, pathological and clinical aspects are dealt with; transmission and vectors are discussed, and diagnostic, therapeutic and prophylactic methods described.

There is a noticeable variation in the emphasis on the different conditions and their features: for example, the chapter on malaria occupies over 80 pages which cover the subject widely and include references to recent (but not the most recent) work on the exo-erythrocytic stages of the parasite; on the other hand, although there is a brief reference to the drug SN 7618, there is none to paludrine. Again, there are 35 pages dealing with epidemic typhus and 5 with murine: but mite-borne typhus only occupies a page and a half and is separated from the typhus group as a subdivision of "exanthemata transmitted by mites or ticks." It would not be reasonable to expect that so tremendous an undertaking as this series of volumes, the preparation of which must inevitably occupy a very long period, should contain the most recent advances in the knowledge and treatment of the diseases concerned. Most of the references are prior to 1945, so that the bulk of the considerable amount of material published since then is not available.

Nevertheless, the volume contains a vast amount of detailed information: there are numerous references, largely in the form of footnotes in the text: the work is fully illustrated with photographs, diagrams, drawings, and a few excellent coloured plates. Many of the photographs might with advantage be reproduced more clearly.

The field is widely covered and there appears to be no tropical condition of consequence which is not dealt with. The volume has been prepared by an imposing team of some 30 collaborators and the list includes a number of recognized authorities whose names will be familiar to workers in tropical medicine.

There is a full table of contents, but the absence of an index in so large and detailed a work is a disadvantage.

H. J. O'D. Burke-Gaffney

HUBBARD, Clarence Andresen [Formerly Head of the Department of Biology and Director of the Pre-Medic Curriculum, Pacific University, Forest Grove, Oregon]. **Fleas of Western North America. Their relation to the Public Health.** pp. ix+533, numerous illustrations. 1947. Ames, Iowa: Iowa State College Press. [36*s.*]

The great part of the book consists of a taxonomic consideration of the fleas known to occur in North America west of the hundredth degree of longitude.

This is prefaced by general introductory matter, including an account of the relation of these insects to public health, and followed by host indices and so forth.

Such a work might well be solid but tedious. The author has been successful in avoiding this, and in communicating some of his own personality and enthusiasm. He leads off with an account of the work and personal careers of three pioneers, C. F. Baker, Nathaniel Charles Rothschild and Karl Jordan, the last two of whom are described as " the inseparable English duo ". The author then sweeps on to the period following the introduction of plague in California in 1900 and writes of new workers who were attracted to the study of the entomology of the disease. From that point he continues right on to 1944, mingling entomology, personal notes, photographs of workers and references to plague in the area. A section on the medical importance of these insects follows. It deals mainly with plague and describes what has occurred in the States of Western North America. It seems that in North America as a whole since " its inception into man in 1900 " there have been 506 human cases with 321 deaths. On a later page the author puts together all the records of the recovery of *P. pestis* from rodents in North America : one notes that the bacillus has been recovered from members of eighteen of the thirty genera of rodents.

The author then passes on to deal rather similarly with typhus but here we feel that he is not on sure ground, for he distinguishes fundamentally between the typhus of the Old World and of the New, and regards murine typhus as a characteristic disease of the New World only. He then reviews our knowledge of the infection of fleas with *Brucella tularensis*, a matter on which North American workers have made most valuable contributions. The introductory section is concluded with paragraphs on fleas as pests of house or farm and on the development of allergy towards these insects. This is followed by practical chapters on trapping small mammals, the technique of mounting and the external anatomy of fleas, with special reference to identification. One notes that in several places in the text the author recommends kerosene as an insecticide and suggests that one should kill flea larvae by watering them with salt water.

The systematic part of the book runs to more than 330 pages and follows conventional lines. It includes not only the distinguishing anatomical characters of each species but data on biology, and seasonal and geographical distribution within Western North America. The host records seem to be very full and in nearly every case the species of host is given a Latin name, an excellent point. One notes that *Tunga penetrans* is listed because of its possible future importance, though it has not yet been identified in the area. *Pulex irritans* is common and widely distributed and occurs on many species of hosts including wild carnivores. *Ctenocephalides felis* is a serious nuisance to man in summer and early autumn, and some individuals become sensitized. It is suggested that they should be treated with " flea antigen ". *Xenopsylla cheopis* is recorded from several western States and British Columbia.

The last part of the book lists the 246 species of flea known to occur in Western North America and shows their occurrence in the separate States. California with 109 species heads the list. A similar index is given of the distribution of 56 species of fleas, unknown to the West, in the Eastern States. There are then a total of 302 species in North America, of which only ten extend from the Atlantic to the Pacific Coasts. A valuable feature of the book is the " host index " which is no bare list but a detailed consideration of all the rodent hosts and all hosts in certain other groups (including man) on which fleas have been found in the area. Under each of these host species there is a page or so of notes on biology of the species of fleas found on that host. The bibliography is a continuation of that published by JELLISON and GOOD (1939).

The book contains an immense amount of local information and will be valued by specialists. The English is often prolix but the author's meaning can be made out. The proof-reading has not been completely successful.

P. A. Buxton

DETHIER, Vincent G. [A.M., Ph.D., Professor of Zoology and Entomology, Ohio State University, etc.]. **Chemical Insect Attractants and Repellents.** pp. xvi+289, 69 figs. 1947. London: H. K. Lewis & Co. Ltd.

The author feels a natural dissatisfaction with the present state of our knowledge about substances which are attractive or repellent to insects and about their mode of action: what we know is based on trial and error and is empirical. He has gathered together a large body of fact which will serve as a foundation for an improved understanding of the subject.

The book covers a wide ground and represents much reading. The author opens with general chapters which give some idea of the type of response that may be observed when insects are exposed to physical stimuli such as odours or humidity. The insect's reactions to stimuli of this type are related to its needs for food, attraction to members of the opposite sex, recognition of members of its own species, discovery of a place in which to lay eggs, and so forth. This is followed by several chapters giving information on the reactions of insects to certain groups of chemical stimuli, *e.g.*, the essential oils, products of fermentation, substances that result from the decomposition of fat, protein, etc. The author also gives attention to physiological methods and apparatus by which one may study and compare these responses. In dealing with baits and traps, the subject is considered generally: the author has wisely omitted a mass of empirical formulae and has not discussed the detailed relation of this type of work to the control of insect pests.

In passing over from attractive to repellent substances, the author reaches a part of his work which is of more immediate interest, perhaps, to the readers of this *Bulletin*. There are sections dealing with repellents against blood-sucking flies, house flies, harvest mites (*Trombicula*) and so forth and these give a good up-to-date account of the subject: it is clear that the author is familiar with both British and American published work. It would perhaps have been welcome if he had felt able to give more attention to the achievements and limitations of some of the most effective repellents such as dimethyl phthalate, Indalone and extracts containing pyrethrum.

The book covers much ground on the borderline between biology and chemistry, the general attitude being careful and scientific. It is hardly possible in the present state of knowledge to discover the principles which may be involved, but the book is likely to be influential in the development of the subject.

P. A. Buxton

DANIELSSEN, D. C. & BOECK, C. W. **Atlas de la Lèpre. Bergen en Norvège. 1847.** [Atlas of Leprosy.] (Édition commemorative du céntenaire.) [Re-edited by H. C. de Souza-Araujo.] 1946. Rio de Janeiro.

Professor de Souza-Araujo has performed another service to leprologists. He has re-edited the Facsimile of Danielssen and Boeck's original *Atlas of Leprosy* and brought it out (in monochrome) in commemoration of the work first published in colour in Norway in 1847. Professor de Souza-Araujo had three objects in view in undertaking this issue. First, to keep green the memory of the two famous Norwegians, Daniel Cornelius Danielssen and Carl Wilhelm Boeck, who may justly be regarded as the founders of modern leprology; second, to help the International Leprosy Association to re-establish, or at

least to re-organize, the Bureau and the International Journal of Leprosy at Manila University, destroyed by the Japanese in the last war by presenting to it the proceeds—a most munificent gesture as the Professor would doubtless reap a rich harvest from the sale of such a work. His third aim was to make the younger workers in this field acquainted with the sterling work of their predecessors

The price affixed to the *Atlas* is $5.00 (U.S.A.) or £1, which should be sent to Dr. Ernest Muir, Secretary-General of the International Leprosy Association, 167, Victoria Street, London, S.W.1.

The *Atlas* comprises two portraits of Danielssen and one of Boeck, and 24 black and white plates, full-page and beautifully reproduced depicting the many forms and stages of this disease. Appended is a facsimile reproduction of the title-page of the original treatise on leprosy, or " Éléphantiasis des Grecs " as they called it, which accompanied the original *Atlas* of coloured plates, published by J. B. Baillière in Paris and H. Baillière in London.

Tropical workers owe a twofold debt to Professor de Souza-Araujo ; for his thought of bringing out this volume and for the excellence of his accomplishment.

H. Harold Scott

SCHOEN, Rudolf *et al.* **Internal Medicine. Part I.** Fiat Review of German Science 1939–1946. 388 pp., 18 figs. 1948. Published by Office of Military Government for Germany, Field Information Agencies Technical, British, French, U.S.

This volume, written in German, in the FIAT series of publications designed to inform international science of research done in Germany during the war years, reviews the work undertaken in connexion with " internal medicine ".

Almost half of the 388 pages are occupied by the first chapter which reviews work done on infectious diseases : these include bacillary infections, rickettsial diseases, virus and protozoal diseases, with briefer references to metazoan infections and general theoretical considerations. This chapter includes a brief reference to cholera, some ten pages dealing with typhus and a similar number with malaria and amoebic dysentery. In the last two cases, the papers deal largely with the wartime incidence and treatment of the diseases.

The remaining five chapters deal with work on diseases of the circulatory, respiratory, digestive and urinary systems and with allergy. Each section contains a list of references to the workers concerned, which from their length indicate that much investigational work was undertaken : the descriptions of the work are however necessarily brief. *H. J. O'D. Burke-Gaffney*

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